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POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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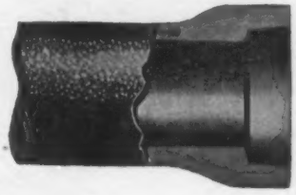
VOL. XXVI NO. 14 | SAN FRANCISCO, APRIL 8, 1911 | PER COPY, 25 CENTS

Why J-M Fibre Conduit is Superior

Tee



J-M Conduit

Socket Joint

Cross

If you have anything whatever to do with underground cables—with installation costs, the time required, the avoidance of cable troubles, or the efficiency or maintenance after the cables are laid—you should know some of the facts about J-M Fibre Conduit. It's a matter of dollars and cents.

J-M Fibre Conduit is the strongest and most durable conduit on the market.

It weighs only one-sixth as much as clay or other stoneware conduit. That greatly reduces freight and hauling charges and makes the conduit much easier to handle.

J-M Fibre Conduit is made in longer sections than stoneware conduit. That means less jointing, faster laying. And the alignment is taken care of in the manufacture—no truing up necessary when laying. And no wrapping or cementing is required. So an ordinary laborer can lay it—a big saving in wages.

The bore is glass-smooth throughout—no bumps or roughness to cause abrasions of the cable-sheath. That eliminates the cause of many cable troubles.

No Mandrel (rod) nor rope is required in inserting the cable through J-M Fibre Conduit.

The joints are water-tight, and practically gas-tight. That, together with the nature of the material, gives greatest insulating efficiency.

The danger of electrolysis is practically nil. So is the danger of fire in case of short circuit.

And—unlike clay—there is practically no breakage.

How You Save By Installing J-M Fibre Conduit

The data given below was compiled from information furnished by one of the largest users of Conduit in the country, and is based on an installation of several million feet. The figures represent actual facts based on 1,000 feet of a 4-duct subway.

Saving in Breakage

Tile Conduit averages in breakage, on 4,000 duct ft. (5%)	$10.00
J-M Fibre Conduit averages in breakage, on 4,000 duct ft. (0%)	0.00
Saving effected by J-M Fibre Conduit	$10.00

Saving in Freight Charges

Tile Conduit averages in weight, on 4,000 duct ft.	32,000 lbs.
J-M Fibre Conduit averages in weight on 4,000 duct ft.	5,000 lbs.
Saving in weight with J-M Fibre Conduit for 4,000 duct ft.	27,000 lbs.

Saving in Trucking to and from R. R.

Tile Conduit, per 4,000 duct ft., costs about	$13.88
J-M Fibre Conduit, per 4,000 duct ft., costs about	3.44
Saving effected by J-M Fibre Conduit	$10.44

Saving in Cost of Laying

Tile Conduit, per 4,000 duct ft.	$1,637.96
J-M Fibre Conduit, per 4,000 duct ft.	1,266.32
Saving effected by J-M Fibre Conduit	$ 371.64

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J-M Fibre Junction Box

FOR INDEX TO ADVERTISEMENTS SEE PAGE EIGHT

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Are made in every type for transmission line, catenary, telephone, inlet, wall, floor, tank switch, lightning arrester, storage battery, interior wiring, etc., They are designed and guaranteed to meet the most rigid specifications of engineers engaged in the designing of transmission lines and all accessory equipment. Submit vour specific requirements.

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ELECTRIC EQUIPMENT OF COLUMBIA STEEL PLANT

BY W. W. HANSCOM.

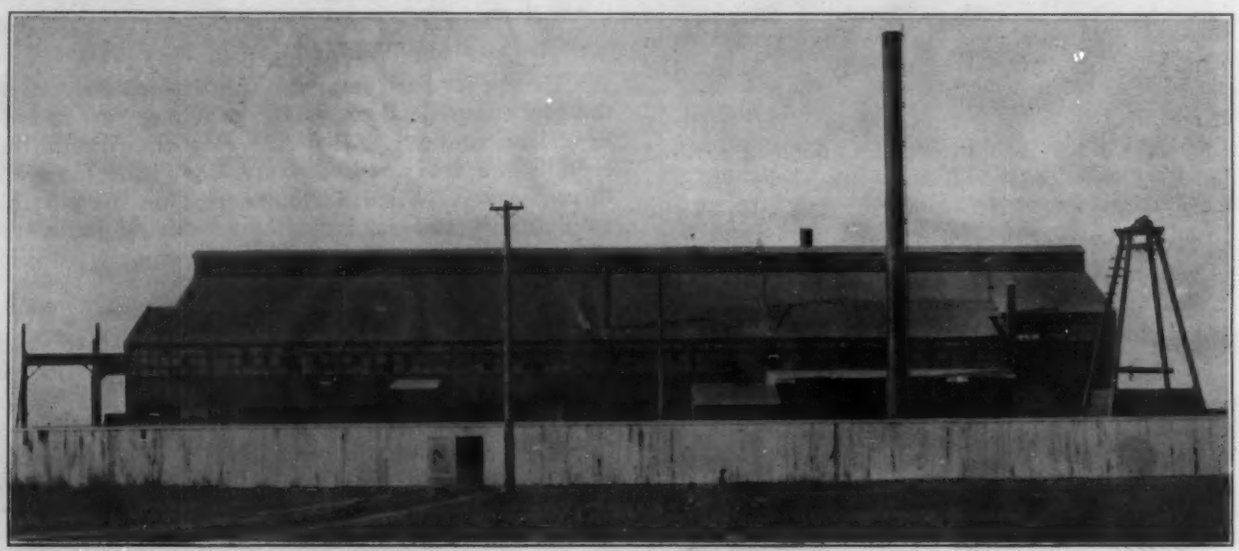
The plant of the Columbia Steel Company, devoted exclusively to the making of steel castings, is situated on the banks of the New York Slough about thirty miles from San Francisco and about one mile from the town of Black Diamond, since renamed Pittsburg.

The location is ideal from a manufacturing standpoint, having direct communication by rail and water with the surrounding territory. The main lines of the Southern Pacific and Santa Fe Railroads connect with the spur tracks running through the works and the river steamers land at the company's private wharf.

The grounds cover an area of twenty acres and have a water frontage of 800 ft. The surface is naturally level and the soil such as to form a good foundation for the storage bins and buildings. Part of the ground area is covered by the foundry, office, chemical laboratory, pattern loft, pattern shop, storage bins, living quarters for the men and oil storage tanks, leaving considerable room for future extensions. The first of the buildings above mentioned is of structural steel, the next four of pressed brick and the balance of wood.

The product covers mild and high carbon steel, manganese and alloyed steel castings.

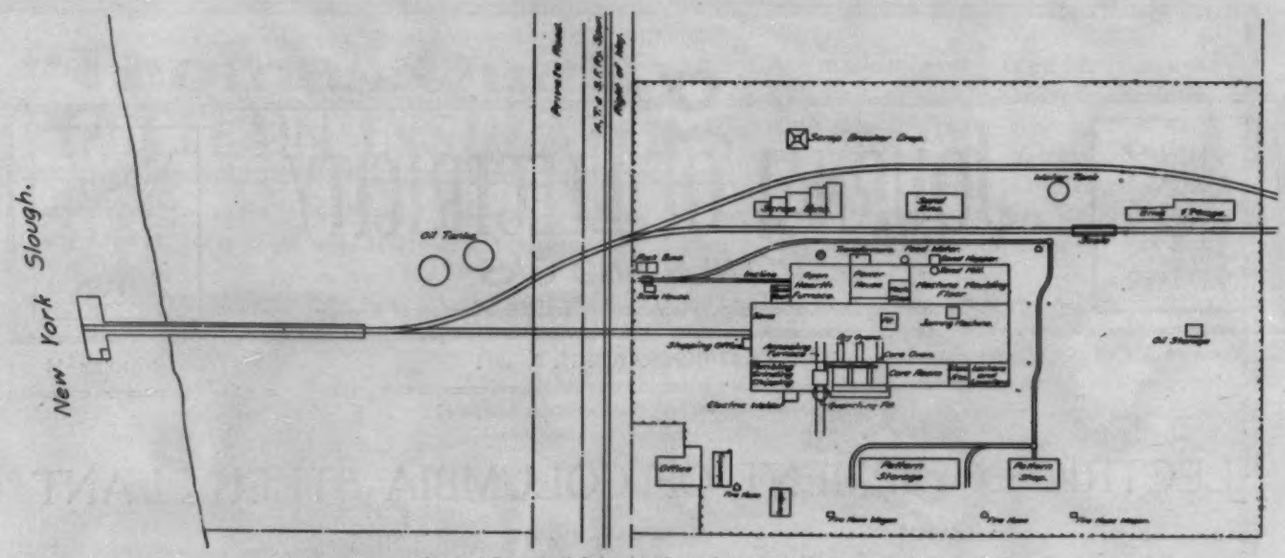
The main foundry building is 260x130 ft. and is of structural steel covered with corrugated iron. The main crane runway is supported upon heavy steel columns resting upon a continuous reinforced concrete foundation. The runway extends to a distance of 40 ft. past the rear of the foundry building and over the flask storage yard.



Plant of the Columbia Steel Company.

Oil is used entirely for fuel and is stored in two large wooden tanks near tide water. From the tanks lead pipes run to the dock for filling and to the works for distribution. The supply is obtained from barges or tank steamers which can tie up to the wharf while discharging. An auxiliary steam boiler is used for supplying steam to the burners and for heating the living quarters when necessary.

The operating portion of the grounds is well cov-



General Layout of Columbia Steel Company's Plant

ered by an industrial track which facilitates the handling of material too light to be transported by the traveling crane or locomotive.

Electricity is used entirely for the operation of the various machines and lighting, current being obtained from the nearby sub-station of the Pacific Gas & Electric Company, through a separate, three-phase feeder, at 4400 volts.

At the property boundary line the feeders pass through a triple pole, pole-top switch, operated from the ground and arranged to entirely disconnect the works in case of necessity.

From the pole the feeders run to a frame structure above the roof and thence through lead covered cable to the switchboard in the power house which is situated about the center of the length and to one side of the main building.

After passing through the current transformers and air break switches, immediately over the main board, the service is connected to the oil primary switches and thence to the transformers.

The air break switches are arranged to entirely disconnect any one of the transformers and its oil switch from the high tension side, for examination and repair.

There are three transformers, made by the General Electric Company, each of 250 k.v.a. capacity, with 4400 volt primary and 440 volt secondary windings. Percentage taps are brought out from the primary winding permitting of connection for a primary voltage ranging from 3950 to 4400. Each transformer has its own control panel upon which is mounted a primary and a secondary automatic release, oil switch, both automatic release coils being connected in series with an inverse time element relay. Connections between the transformers and the board are so arranged as to permit of operating with two transformers connected open delta when the load does not require the use of all three.

The main switchboard consists of five Vermont blue marble panels, three of which are devoted to the control of the transformers, the others having mounted thereon the volt and ammeters, volt-meter receptacle and the distribution switches.

From the switchboard the various circuits lead to the different distribution boards near the groups of motors. The distribution boards are of the panel type mounted in steel cabinets, with vertical busbars, feeding the branch circuits to the motors through enclosed fuses. From the cabinets, the various circuits are lead in conduit underground, to the local switches and controlling devices and from these to the motors.

Wiring System.

Except for horizontal stretches immediately above the roof trusses and on poles, the wiring system is in rigid iron conduit. All of the motors, with the exception of a few small ones, are wound for 440 volts, three-phase. The small motors used on the portable mold dryers and sand riddles are single-phase, 110 volts, and are supplied from the lighting transformers.

Outlets for the portable motors and lights are provided on alternate columns supporting the crane runway and are so distributed as to make it possible to use portable lighting over the entire moulding floor.

Three-phase, 440 volt power outlets are also provided for temporary motors and consist of fused switches mounted in steel cabinets with doors and located conveniently on each side of the main foundry floor.

Motor Operated Machinery.

The following machines are in use at present:

11x12 duplex air compressor with..	75	h.p.,	900 r.p.m. motor
2 lb. centrifugal air compressor....	30	h.p.,	3400 r.p.m. motor
Sand grinder	30	h.p.,	1800 r.p.m. motor
Electric welding motor generator..	50	h.p.,	900 r.p.m. motor
Scrap breaker hoist	20	h.p.,	1200 r.p.m. motor
Tumbling barrel	40	h.p.,	1200 r.p.m. motor
Cut off saw, 26 in. blade.....	10	h.p.,	900 r.p.m. motor
Swing grinder counter	10	h.p.,	1800 r.p.m. motor
Pattern shop drive	10	h.p.,	1800 r.p.m. motor
Draw shaper	10	h.p.,	1800 r.p.m. motor
Machine shop drive	7½	h.p.,	1800 r.p.m. motor
Test machine	5	h.p.,	1800 r.p.m. motor
Higley saw	5	h.p.,	1800 r.p.m. motor
Core machine	1	h.p.,	1800 r.p.m. motor
Portable centrifugal pump	2	h.p.,	1800 r.p.m. motor
Dry grinders (2) each	7½	h.p.,	900 r.p.m. motor
Carpenter shop	10	h.p.,	1800 r.p.m. motor
Restaurant oil burning system.....	1	h.p.,	900 r.p.m. motor
Portable mold dryer	¼	h.p.,	1800 r.p.m. motor
Portable riddles, (2) each	¼	h.p.,	1200 r.p.m. motor
Lifting magnet motor generator...	7½	h.p.,	1800 r.p.m. motor

Cranes.

The two cranes are each of 60 ft. span, one being of 30 tons capacity, the other 10 tons. The larger crane is used for the heavy work, pouring, etc., and is fitted with a 30 h.p., 1200 r.p.m. motor on the main hoist giving a hook speed of 12 ft. per minute. The auxiliary hoist is fitted with a 22 h.p., 1200 r.p.m. motor, giving a hook speed of 50 ft. per min.

The trolley is operated at a speed of 100 ft. per minute by a 7½ h.p. motor, 1800 r.p.m. and the bridge, 200 ft. per minute by a 30 h.p. motor, 1200 r.p.m.

The smaller crane is used for the lighter work, including castings, flasks and molds, and is fitted with a 22 h.p., 650 r.p.m. motor for the hoist giving a hook speed of 20 ft. per min., a 22 h.p., 1200 r.p.m. motor on the bridge giving a speed of 325 ft. per min. and a 4 h.p., 1200 r.p.m. motor giving a trolley speed of 100 ft. per min. All the above motors are variable speed, 440 volt, three-phase and are controlled by drum type controllers in the operator's cage. All of the hoists are fitted with safety limit switches, mechanical and electrical brakes.

In addition to the above cranes there are two trolley hoists each of two tons capacity, with a lifting speed of 10 ft. per min. and fitted with a single 3 h.p. motor, operated from the floor by ropes.

Charging Machine.

The charging machine is of the Wellman type, consisting of a heavy structural steel frame work carrying a reversible trolley upon which is mounted the charging head. The machine is used for placing the charges of raw material in the open hearth furnace and is operated by four variable speed, three-phase motors with drum controllers. The structure travels on a track paralleling the front of the furnace and on a level slightly below the charging doors.

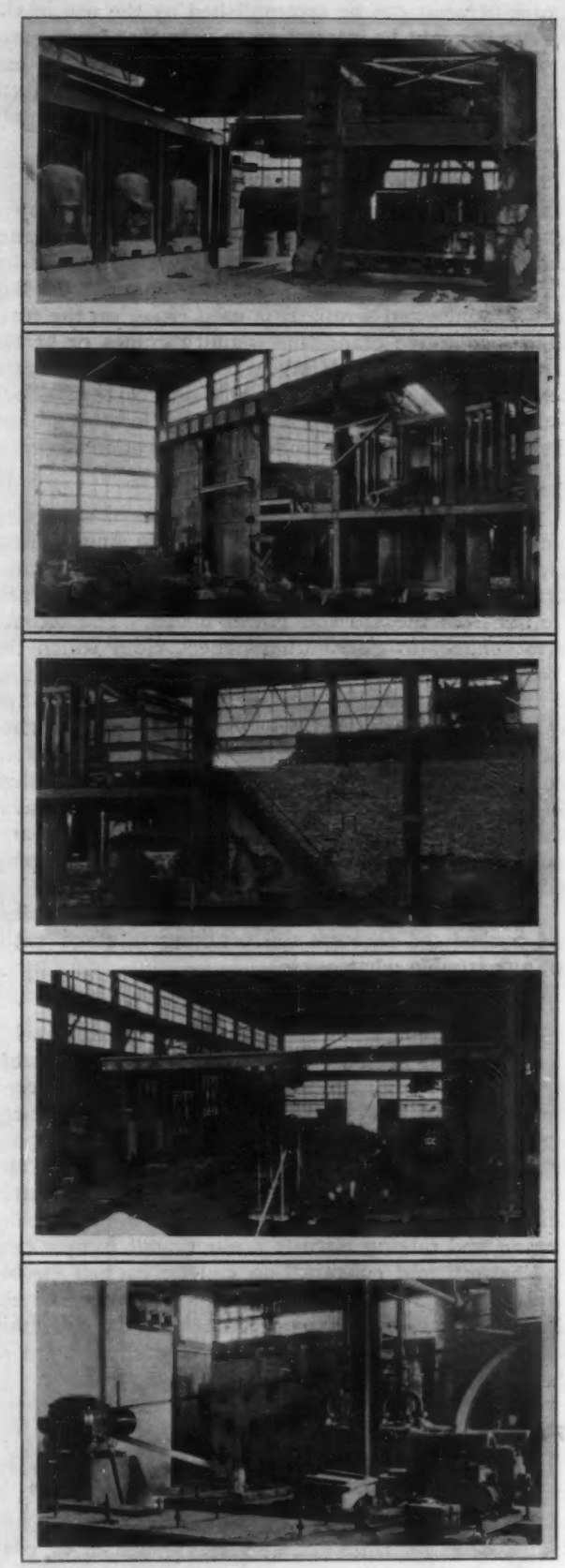
The raw material, stacked in specially constructed steel hoppers, is hauled up to the charging platform on cars. The hoppers are then picked up, one by one, by the charging head which can be racked in or out and revolved. After the charging door is opened, the head is run in and tilted, distributing the raw material over the bed of the furnace. By the use of this machine a large amount of material can be charged in a short time, by one man and a helper, without allowing an excess of cold air to enter the furnace. Three of the motors are of 22 h.p. at 675 r.p.m. and the other 7½ h.p. at 1080 r.p.m.

Peel Machine.

This machine is used for transferring special steel castings from the annealing furnace to the quenching pit and consists of a car carrying a special form of scoop or shovel so arranged as to be run in under the castings, raised, withdrawn, run over the quenching pit and the castings then dropped into the pit. The peel machine is operated by two 7½ h.p. variable speed motors with drum controllers.

Electric Welding Outfit.

The electric welding outfit consists of a special direct current generator coupled to a three-phase induction motor, automatic controlling device and carbon electrode. The generator has a rated capacity of 500 amperes at 60 volts but in practice it is frequently operated at 80 volts and up to 600 amperes.



Views in Columbia Steel Company's Plant showing Charging Machine, Furnaces, Melting Pot, Foundry, Air Compressor and Switchboard.

A bank of low value cast grid resistances controlled by two switches makes it possible to obtain current values from 170 to 600 amperes, in four steps which cover all practical requirements. As an ex-

ample of what can be accomplished by the use of the welder it might be interesting to note that large gates or risers having a cross section of about 5x7 in. can be burned off and the casting smoothed in one sixth the time required to set the casting and cut the gate off in a cold saw or draw shaper.

Lifting Magnet Outfit.

This consists of a 43 in. magnet operated by a motor generator set in the power house. The magnet has a maximum capacity of 10 tons and is used for lifting the scrap breaker ball, unloading and loading cars, castings and scrap. It is used either on the traveling locomotive crane, the foundry cranes or at the scrap breaker hoist. Current is supplied through a flexible cable, plugged in at any one of the various waterproof outlet boxes, conveniently located around the works and supplied from an underground feeder.

Lighting System.

Current for lighting the buildings and supplying the small motors is supplied from three single-phase, 5 kw. transformers, one across each phase. The transformers are placed at the centers of distribution and are fed from the 440 volt power mains. The secondaries connect to distributing panels, from which the various circuits are lead to the lamps. For lighting the foundry, generally, flaming arcs, 500 watt and 100 watt tungstens are used, while over the core benches and for portable lights carbon filament lamps fitted with guards or Holophane steel reflectors are installed.

The offices, club rooms, dining rooms and lavatories are lighted by tungsten lamp units of 100 watts each while the pattern loft, pattern shop and sleeping rooms are lighted by carbon filament lamps.

The entire lighting system is installed in conduit and has passed through the breaking in stage without any trouble whatsoever.

Telephone System.

An intercommunicating telephone system with 11 stations has been installed, using lead covered cable throughout. Communication is established between the offices, pattern loft, pattern shop, foundry, charging floor, engine room, chemical laboratory, shipping department, store room and living quarters. Telephones are of either the desk or wall type, the latter being incased in enameled steel boxes. Both the ringing and talking circuits are operated from a central battery and conversation can be carried on between five pairs of stations simultaneously. The entire installation has been carried out by the Columbia Steel Company's own force under the supervision of the writer.

FUEL OIL FOR THE NAVY.

The California State Mineralogist, L. E. Aubury, in conjunction with a large number of producers, is conducting an energetic campaign to have oil fuel adopted by the United States Navy instead of coal. On April 5th a strong memorial was sent to the Secretary of the Navy in which the permanency of supply is assured and its economical advantages detailed. California oil can be laid down at Puget Sound at a cost of 90 cents per barrel, at Mare Island for 80 cents, and at Honolulu for $1.20, under large contracts.

OIL BURNING.

BY E. N. PERCY.
(Concluded.)

It has not been possible to use a refined type of burner in the ordinary apparatus for the generation of illuminating gas from oil, because the tips burn off. Hence fires are maintained with the crudest possible type of pipe burner, yet giving excellent results. Crematories and glass furnaces requiring high temperatures are operated on the regenerative system, whereby the waste products heat a stove during one cycle foot and during the other the draft is returned through this stove and reaches the furnace in intensely superheated.

There have been many efforts to solidify oil or to use it as the principal constituent of a briquette for domestic purposes and several such enterprises have failed. Supposing that in some manner the oil itself could be used in the home, it is hardly conceivable that a briquetting company operating on any scale could reach the consumer except through the dealer. The basic price is approximately $1.00 a bbl. and it takes four bbl. to equal a ton of coal. Dealers are not paying much more than $4.00 to $6.00 for coal which is delivered to the consumer for $15.00 to $20.00. Since crude oil in retail quantities, with the expense of delivering, storage, etc., costs almost as much as the coal, it can be seen that there is little or no margin for profit in this business. Furthermore large bodies of peat, lignite and coal lie undeveloped at several points in the West, not because of any deficiency within themselves, but because the Western market is so small and covers so large a territory.

Furnaces.

There are many ways of preparing any common boiler to burn oil but a comparatively few principles to be observed in accomplishing it successfully. Fig. 30 shows a tunnel fired boiler with fire in front. Fig. 31 shows a tunnel fired boiler with fire in back. Either one works fairly well under heavy load, especially if a conical flame be used, but under light load when the flame is cut to minimum proportion there will always be an excess of air coming in from the top of the flame and most tunnel fire boilers show an excess of air under any conditions. It has been found that tunnel boilers equipped as in Fig. 31 make trouble through the frequent failure of the arches.

Fig. 32 shows an old style method of firing a boiler with a target which was considered necessary to properly ignite the oil and in point of fact was necessary in the days when atomization had not been reduced to the science that it is now. At the present stage of development any oil burning expert would not accept a burner which would fail to maintain a suspended flame clear and smokeless in a cold furnace. Fig. 33 shows another method of firing a return tubular boiler. This method is now little used, it being merely another form of the target.

Fig. 34 and 35 show still other methods, the objection to either of them is that a heavy fire would be very apt to strike the middle of the boiler. Fig. 36 shows a return tubular boiler equipped for oil burning according to the best current practice. Fig. 37 shows one method of firing water tube boilers. Figs. 38, 39 and 40 illustrates still other methods for various boilers.

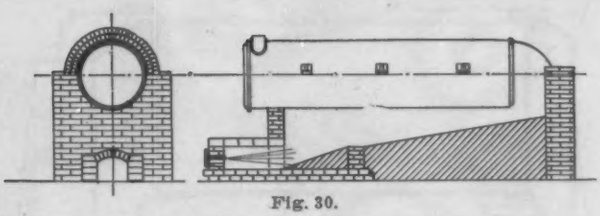


Fig. 30.

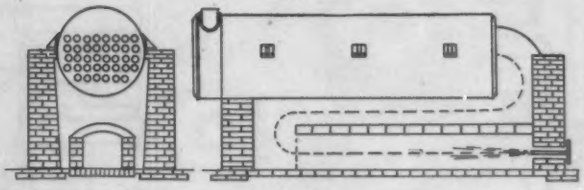


Fig. 31.

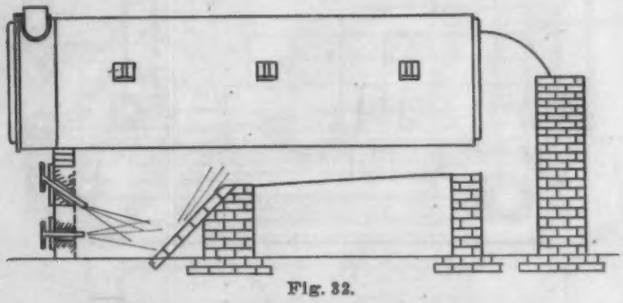


Fig. 32.

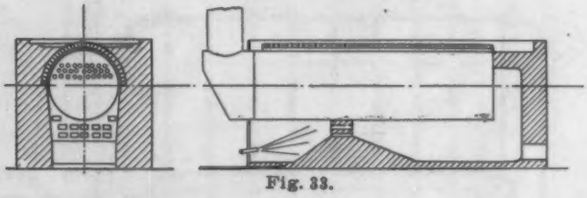


Fig. 33.

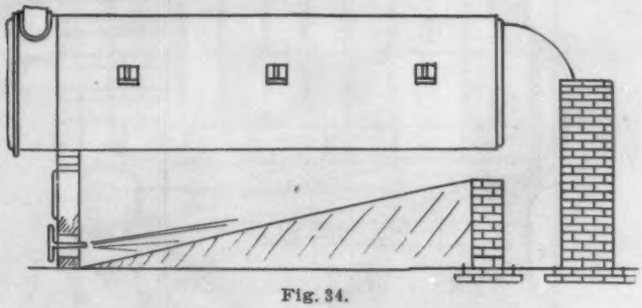


Fig. 34.

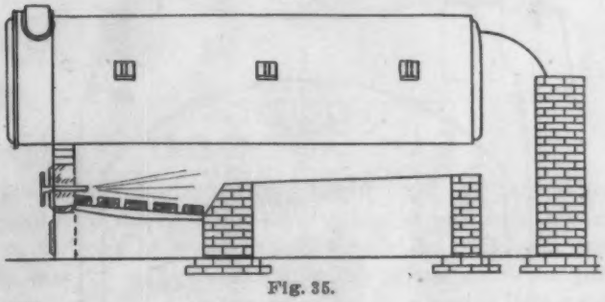


Fig. 35.

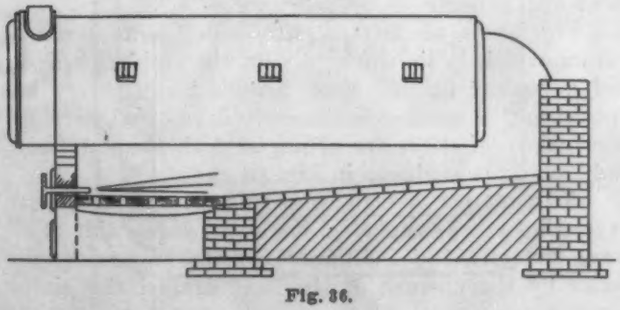


Fig. 36.

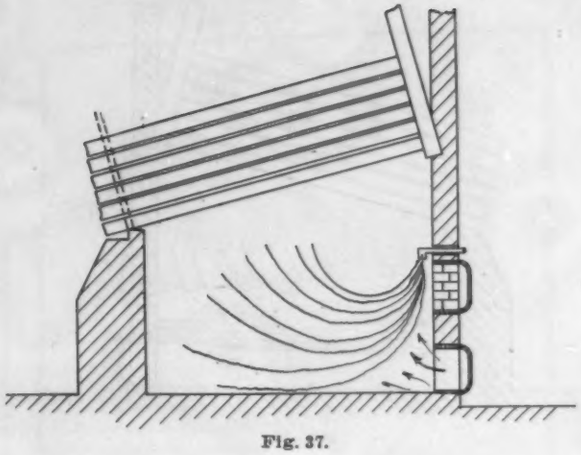


Fig. 37.

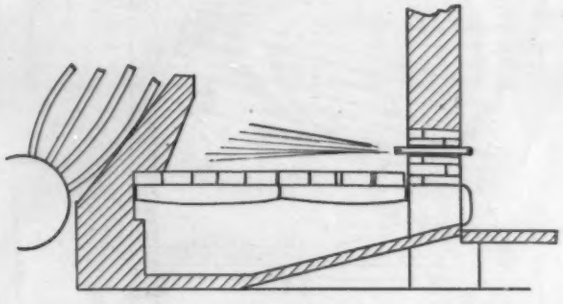


Fig. 38.

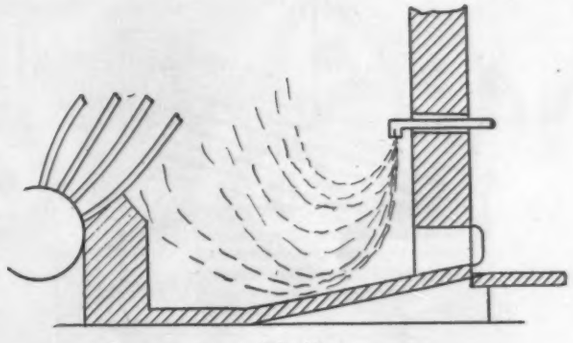


Fig. 39.

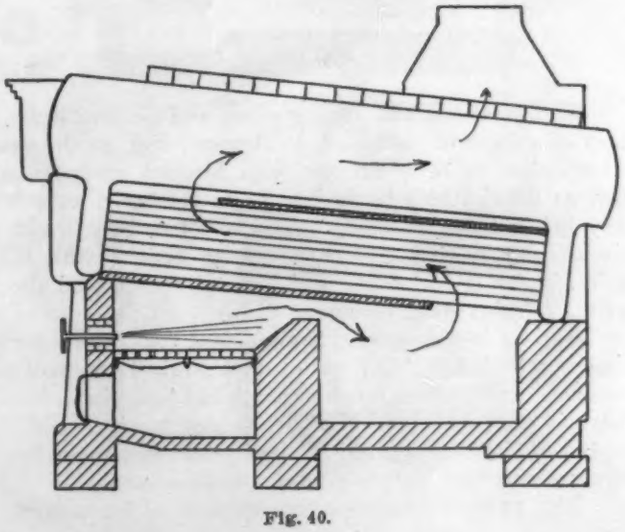


Fig. 40.

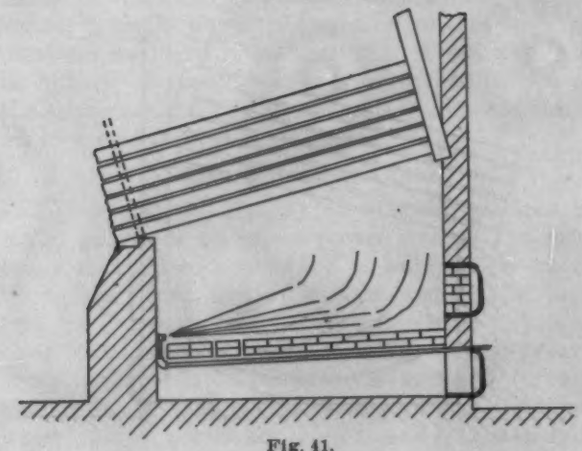
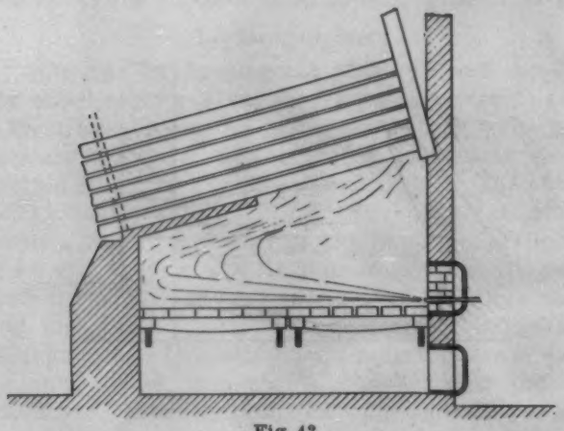


Fig. 41.



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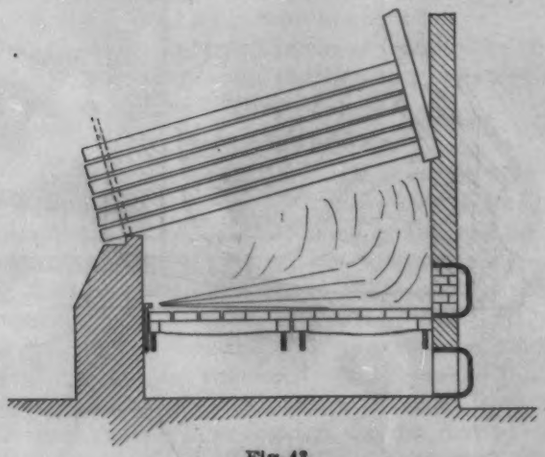


Fig. 43.

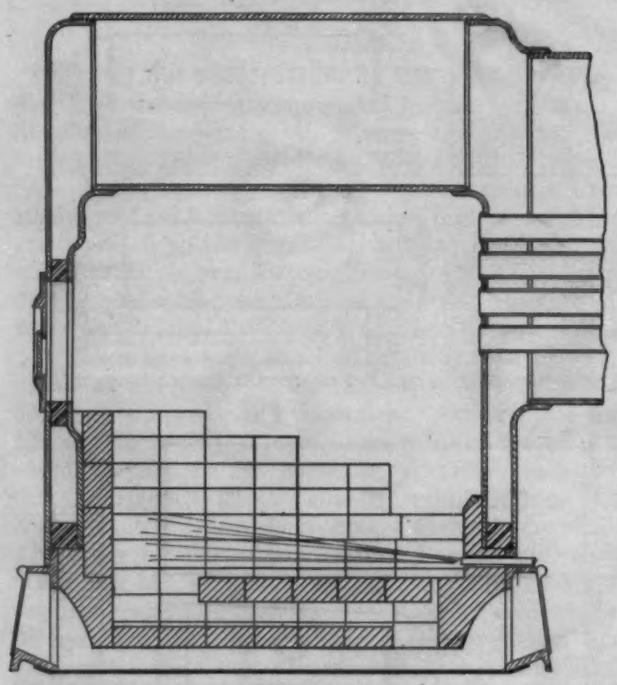


Fig. 44.

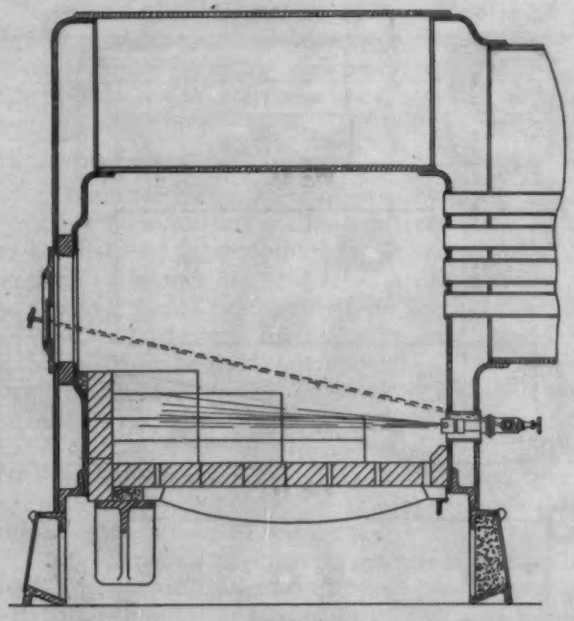


Fig. 45.

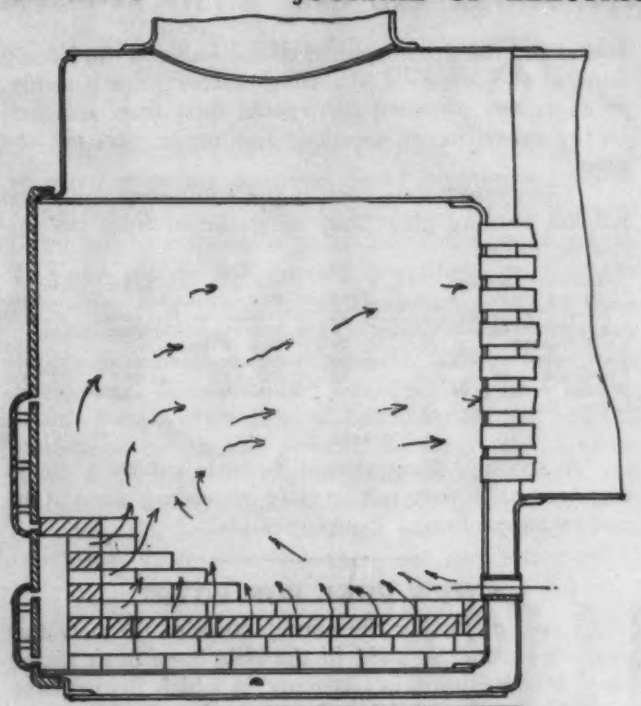
Fig. 41 shows the arrangement and general draft lines of a forward shot B. & W. boiler. Fig. 42 shows a back-shot B. & W. boiler with bricked up grates. Fig. 43 illustrates a back-shot B. & W. boiler especially bricked up for oil firing. There has been much discussion about these arrangements because the B. & W. boiler is so widely and generally used and the writer refrains from comment.

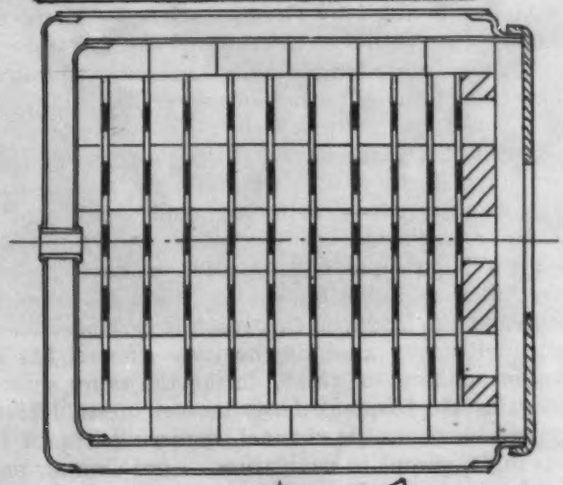
Fig. 44 is a frequent arrangement for locomotive boilers which has been quite successful, after many experiments in which much damage has been done, but there is at the present time no representative or accepted method recognized as the best arrangement for locomotives.

Fig. 45 shows another arrangement of locomotive boiler that has been found quite successful by a well known smelting company who operate their own locomotives. Fig. 46 shows three views of another arrangement in successful actual use. Fig. 47 and 48 show still others.

Fig. 49 is an internal fire boiler with a round burner which is shown here with the end bricked up and a conical flame. Most Scotch boilers were arranged in this manner in the early days of oil burning. Now many of them are arranged with the flat flame and long draft as shown in Fig. 50.

As a matter of fact, in practice, a conical burner never throws a true conical flame, the lower side is always distorted and the upper side driven against the boiler by the up-rush of the heat against the air or





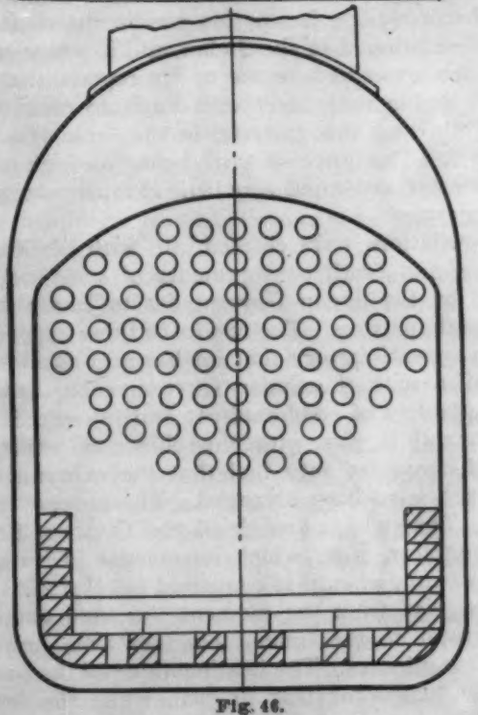


Fig. 46.

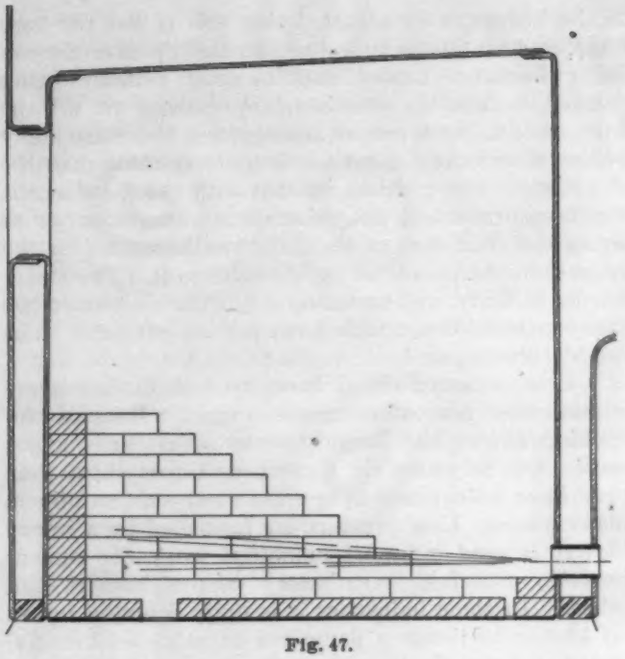


Fig. 47.

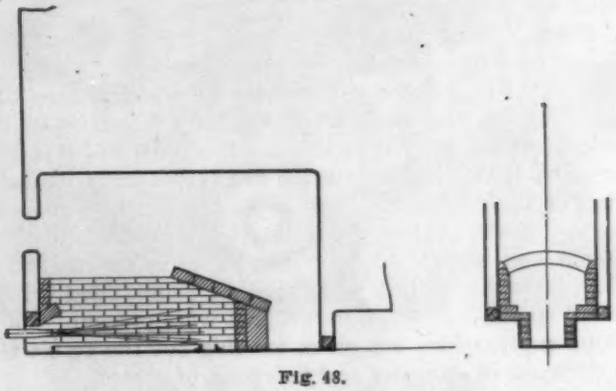


Fig. 48.

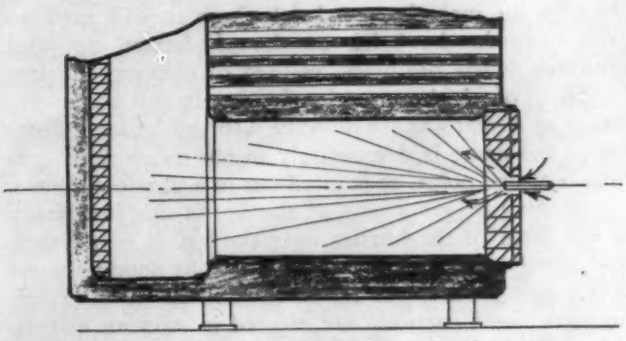


Fig. 49.

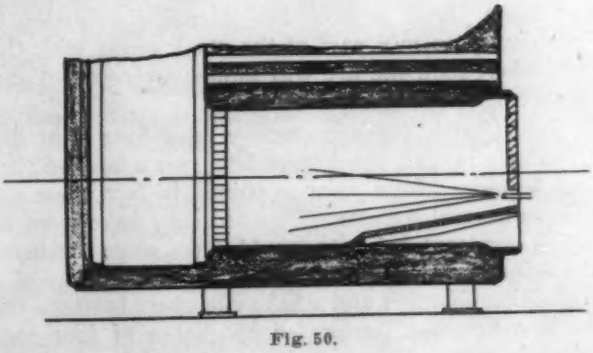


Fig. 50.

if the burner is so adjusted that this is not the case then cold air passes round the burner up over the fire as it becomes heated and escapes without being burned, unless the fire is heavy enough to fill the burner. Still with proper arrangement there are many places where the conical fire is more suitable than the flat flame. The greatest trouble with the flat flame is that engineers will not trim their burners so as to bring the shoulders of the flame well forward in the corners of the burner at right angles to it. The steam burner is fairly well understood but the air burner has many possibilities which have not as yet been thoroughly investigated.

Low pressure air of from 2 to 10 lb. has many possibilities heretofore unrecognized. Burners for cooking stoves and ranges were never satisfactory until low pressure air was used, since which time they have been made to operate most successfully in many places. Low pressure air furnished by a rotary blower is used for most industrial work, for cement burners, procelain, reverbatory copper burners and other. In some industries it is quite common for an oil burner to throw a flame ten or more feet in diameter and 120 ft. long, low pressure air only being used for atomization.

Every color of the rainbow can be found in an oil flame, each of which has its own meaning. In a general way an oil flame is supposed by practical men to be doing its best work when it is of a beautiful pink color, if it be duller than this it will smoke and if it be brighter it will burn the brick and is generally indicative of an intense combustion arising partly from an excess of air. When the oil is highly heated and the steam and air are likewise the flame is apt to star, that is to have the appearance of being filled with small sparks as though iron filings were present. Various explanations are given for this but the result is a decrease in economy and a deposit of carbon.

When an oil flame of this fish-tail variety is working close to an incandescent brick floor it will tend to drop towards the brick as though heated up, and should it touch the brick, instead of obeying the law for angle of incidence and reflection it will strike upwards at a sharp angle directly into the boiler. Tearing of the flame is due entirely to too much draft cutting in at one point, as pointed out in a previous figure.

Puffing or vibrations of the fire is due invariably to the form of the burner near the tip, it being such that small quantities of oil gather in the spoon shaped cavity just back of the tip and when the oil is at low pressure these particles are ejected in varying quantities. With lime kilns and some forms of metallurgical furnaces in which it is desirable to have a large flame plume without too intense combustion it is customary to mix part of the stack gases with the draft, whereupon the fire will immediately soften and decrease in intensity.

Some brick yards make use of a long thin fire known as a rat-tail, the burner being on a hose so that it can be moved from point to point. In fact, there are at times several burners. The ordinary bake oven as used in our large bakeries would make some mechanical engineers sit up and take notice. It consists of a combustion chamber and a bake chamber; between the two is a fire wall perforated by pieces of four inch hydraulic pipe. This pipe has each end hermetically sealed and the fire is applied to one end and the baking done at the other. Circulating water, quite possibly, at enormous pressure carries the heat from one end to the other, never escaping and never bursting the pipe.

The approximate cost of the equipment for a 600 h.p. oil burning plant may be gathered from the following table:

2 duplex pumps, 4½ x 3¾ x 4 in.	$140	1 240-bbl. oil tank, f.o.b. San Francisco	$390
1 relief valve	10	Foundation for same	125
1 air chamber	6	1 380-bbl. oil tank, f.o.b. San Francisco	480
1 oil heater	60	Foundation for same	150
4 oil burners	80	1 500-bbl. oil tank	900
Firebrick per M.	30	Foundation for same	250
Piping, valves, etc.	100		
Labor, etc.	200		
	$620		

A 100 h.p. plant should be installed by a clever engineer at a cost not greatly exceeding $200 if he makes an oil heater from pipes.

A NEW FUEL FOR EGYPT.

Experiments for the manufacture of the new fuel produced from the sudd of the Nile have been taking place at Meresburg, in Germany, in which British capital (chiefly) is aided by German science. These experiments are the direct outcome of the foresight of Lord Cromer, and of his equally far-seeing colleague, the Governor General of the Sudan, Sir Reginald Wingate. One of the greatest difficulties with which the pioneers of the Sudan have had to contend has been the constant blocking of its natural highway, the Nile, by masses of weedy growth, commonly spoken of as sudd. For a distance of 300 miles the Nile runs through a huge morass, estimated to cover 35,000 square miles, which is known as the sudd district. Throughout the length of this reach it is impossible to secure fuel of any kind, as the river channel has no banks, in addition to which, during the rainy season, when gales are frequent, large masses of sudd break away and block up the channel, rendering it unfit for and even dangerous to navigation. Lord Cromer realized what a serious factor this was in the retardation of the development of the Sudan, and it was a suggestion of his contained in one of his reports that led a German diplomatist, Herr vom Rath, to conceive the idea of utilizing this material in the form of a cheap local fuel. The price of coal being as high as 66s. ($16) per ton, and wood very little cheaper, encouraged the suggestion.

Negotiations were entered into with Sir Reginald Wingate, and small consignments of sudd were dispatched by the Sudan Government to Berlin for experimental purposes. The results of these experiments were so far satisfactory that further negotiations were undertaken with the Sudan Government. A considerable quantity of sudd was cut and brought back to Europe, and it was with the object of seeing this material converted into fuel that the experiments at Merseburg have been arranged. The process is very simple. The sudd is first dried and then put through a disintegrator, from which it emerges in an almost powdery form, when it is converted into briquets. The time occupied from the moment the sudd enters the disintegrator to the time it emerges as a briquet is only a few minutes. The heating value of the new fuel is nearly two-thirds that of coal, while the briquets themselves have a density of four-fifths that of coal.

NEW STEAM PLANT OF SOUTHERN CALIFORNIA EDISON COMPANY.

BY H. W. DENNIS.

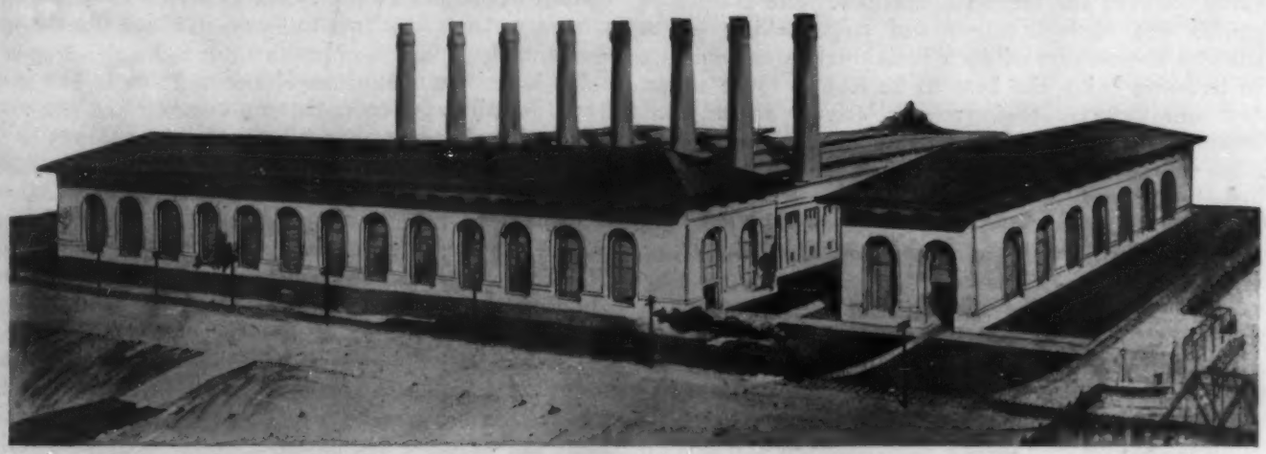
The Southern California Edison Company is now engaged upon the construction of a power station at Long Beach, Los Angeles County, California, wherein there will be installed a 12,000 kw. steam turbine unit. The new station will operate in conjunction with the company's other plants of which there are six hydraulic developments and one other major steam auxiliary supplying power in the counties of Los Angeles, San Bernardino, Riverside and Orange. It is not known at this time what will be the ultimate capacity of the station, although the present buildings and foundations are designed to provide for a duplicate of the equipment which the company is about to install. It may be said, however, that the general layout is on the "unit" system, so that the plant may be extended indefinitely as such extension becomes justifiable, and with this in view the company purchased a parcel of land comprising about 10 acres. The site is considered to be a most advantageous one for many reasons, principally, however, on account of its location which borders on the entrance to what is known as the Long Beach Inner Harbor. This channel will therefore provide water for condensing purposes, supplying all of the ocean water which will be required, and the controlling works will not be subjected to the violence which would be invited if they were located on the open beach.

The present construction for this steam station will comprise two buildings having a combined floor space of nearly an acre. The generator and boiler house will have a floor area of 30,000 square feet and will be 60 feet high, while the building which will contain the electrical switches and transformers will cover 7600 square feet and will be four stories in height. Both structures are to be of reinforced concrete with artificial stone base, ornamental copper cornice and mission tile roof. The generator room will have a floor of imported Welsh quarry tile, with a glazed tile wainscot. Everything considered this will be the handsomest and best equipped steam plant west of Chicago.

For supplying the steam for this turbine and its accessories, there are 8 Stirling boilers, each of which will deliver continuously 30,000 lb. of steam per hour at 225 lb. pressure, and 125 degrees super-heat. For the entire present installation this evaporation is at the rate of 2880 tons of water per day, an amount equal to that contained in an 8 in. water main 50 miles long.

After doing its work in the main turbine, the steam passes into the condenser, where it is converted again into water, a process which not only provides better economy in operation, i. e., more power per pound of steam used, but saves most of the water, which is then returned to the boilers to be again evaporated.

The circulating water for cooling the surfaces with which the steam comes into contact is to be salt water pumped from and returned to the Inner Harbor. The condenser itself is an immense cast iron shell containing over nineteen miles of brass tubing through which the salt water "circulates." The entire circulating system makes use of the principal of the syphon so that the pumps have to overcome only the friction in the condenser, and in the pipes between the intake conduit and the outfall conduit.



New Steam Plant of Southern California Edison Company

Crude oil will be used for fuel, and a large storage tank of concrete will be provided. Auxiliary tanks will be located adjacent to the boiler room so that the oil pumps for each unit may be relatively near their source of supply. The oil will be received either in tank cars or through an oil main which passes the company's property.

The switchboard from which all of the machinery and switches will be controlled, is to be situated in the generator building, although the transformers and switches are to be installed in the transformer house. Electricity will be generated at 11,000 volts and a part of the current will be distributed at this voltage, although the transformers will provide for transformation to 30,000 volts and 60,000 volts, and the long distance transmission will be accomplished at the latter voltage. Double bus bar systems are provided throughout for 11,000, 30,000 and 60,000 volt circuits.

Mr. Frederick Sargent of Chicago has been retained as consulting mechanical engineer. The Southern California Edison Company's engineering department is supervising the construction work and has made all of the designs and plans except the purely architectural details which were designed by Parkinson and Bergstrom of Los Angeles, who have been retained as consulting architects.

CORPORATE ORGANIZATION AND COMBINATION.

There is nothing of greater common interest, nothing which is exciting more comment and discussion at the present moment, than the questions of state control of corporate organizations and of combinations, especially of those controlling public utilities. These are discussed by a writer in the annual report of the American Telephone and Telegraph Company as follows:

Corporate organization and combination are the necessary and logical solution of the problem of caring for the wonderful development which has been going on all over the world, and particularly in this country, in the recent past.

Combination only can cope with that industrial development of the present time which is far beyond the scope of individual effort or capital. In those good old times, one man, with his own capital, could carry on even the largest operations. The margin of profits due to low wages and large selling prices enabled the owners of such individual establishments to live and enjoy the best to be had in those times, and amass fortunes—fortunes relatively as large as any of the present—from an amount of gross business, the profits from which today would not be sufficient to pay the wages of a shop superintendent.

The development of the arts, the necessity of extensive laboratories and experimental departments, with technical staffs competent to keep abreast of modern progress and find out how to utilize all of everything, the large gross production at small margin of profit, the large capital requirements necessary to conduct business on these lines; all these place modern industrial enterprises either beyond the financial ability of any one individual, or far beyond the amount that any one individual wishes to have in any one venture.

Without attempting to discuss the history or evolution of "Company," "Corporation," or "Monopoly," and similar organizations or combinations of trade, it can be said that the first and oldest step towards corporate organization was partnership. Corporate combination is but a partnership wherein the partners are represented by shares held in various amounts by the various investors.

These corporate organizations and combinations have become a permanent part of our business machinery; the public would not, if it could, abolish them.

Who would ever consent, or would the requirements of business allow, that the railroads between the great sections of our country revert to the independent lines that once existed, with all the consequential delays, inconveniences and disadvantages to traffic and travel? Who would be content if the telegraph business should be carried on by the transfer of messages from one to another of the numerous companies, formerly independent, but now combined and giving direct transit over the whole country?

That there has been in large measure reason or cause for the existing unfavorable public opinion as to corporations, trusts and combinations, is beyond question, but it does not follow that there is reason or cause for the wholesale denunciation and condemnation of all corporations, trusts and combinations. Nor does it follow that all that is bad is centered in or confined to those prominent in the public eye.

Many of the practices most severely condemned are but the amplification or continuance of practices or customs common in the current affairs of business, practices or customs which were not wrong in themselves, but wrong in the abuse of them.

Public utility corporations and other combinations have too frequently assumed that new laws and regulations were disastrous and ruinous without first giving them a fair trial, and legislators too often have displayed an ignorance or disregard of existing laws, spreading the idea that new legislation was a cure-all for any undesirable condition, while it was often only a political play, and the enforcement of the existing laws was utterly neglected. The results have been bad. While business will adjust itself to any condition if given time and opportunity, sudden change of conditions will result in disaster to some interests, but not as a rule to those at which the change was aimed.

There is too little consideration given to the fact, based on all experience, that no one interest can permanently prosper unless all other interests are in a prosperous condition, and to the fact that any sudden change in existing conditions will always be taken advantage of by some one interest to the detriment of other interests in general.

The proper use of corporate organization or combination under proper regulation or control cannot be objected to.

What is and should be condemned, prevented and punished, is the abuse made of corporate machinery to the detriment of public welfare and such abuse as has been and is being practiced so extensively for purely speculative and oftentimes swindling enterprises.

It is largely this abuse by professional speculative promoters and swindling security vendors, mostly on a comparatively small scale, not in any way associated or connected with the general business organizations or systems, that has been the cause of most of the popular odium surrounding this necessary machinery of business. It does not seem possible that the only way of reaching such offenders is through penalties for "misuse of the mails," but however or by whomever the remedy is applied, he who does it should receive the heartiest thanks and appreciation of the community.

The large corporate combinations which often in popular opinion are supposed to be owned or wholly controlled by some one man or some few men, are, in fact, made up of thousands and tens of thousands of silent partners, the shareholders, who are the real owners. The existence of these real owners, these shareholders, is often obscured in the shadow of some one or more individuals who dominate these companies, not by large ownership, as popularly believed, but by administrative and operating aggressiveness and successful management. The shareholding owners are in the aggregate very numerous and, in any other country than America, would be frequently in evidence and heard from, would always take an active participation in all meetings, annual or special, and would in that way protect themselves and their

holdings by associating the corporation or combination in the minds of the public with the particular and separate individual ownerships, or interests in them. In this way that same protection, recognition or consideration, to which all interests, whether individual or corporate, are alike entitled, would be assured.

Public Utilities—The "Served" and the "Servers."

Under the existing conditions the corporations or combinations represent the "servers." To the shareholders, dividends represent good management and desirable investment, but to many of the community, the community that is "served," profits which in individual enterprise would be considered reasonable are unreasonable and forced out of their pockets by unscrupulous management or illegal or dishonest practices.

The contest between the "served" and the "servers," the "producer" and the "consumer," between "he-who-has" and "he-who-has-not," has been going on from the dawn of civilization, from the time when some one had more of some one thing than he wanted, while another had none, or less than he wanted.

From time immemorial efforts have been made in some way to control or restrict any accumulation, in the hands or in the uncontrolled possession of any individual or set of individuals, of those things which had become necessary to public wants, and to prevent necessities from in any way getting outside that control which natural competition, or the law of supply and demand under normal conditions exercises.

There has always been and will always be the laudable desire of the "server," or the producer, to get and as cheaply as possible, which sometimes selfishly degenerates into a lack of consideration for the rights of those who are serving.

On the other hand there has always been the laudable desire of the "service," or the producer, to get a profit for his service or production, which sometimes degenerates into a selfish disregard or lack of consideration for those who are served.

This conflict, which originated with the first commercial transaction or exchange, has continued ever since and will continue to the end of time.

Until the state, or conditions under which society was organized, began to be complex there were very few things which were not and could not be regulated by the law of supply and demand, the law of substitution of one article for another in case of scarcity, or by the laws of competition. In the simple life, which was with the masses of the people until very recent years enforced, and is with all laudable, there were few articles which were in themselves necessities, and of these very few which did not have alternative articles of use, or substitutes, and, in fact, there was little that was not produced by the local community or by the family. Those few things which, in the growth of civilization, and particularly by the increase of urban population, were of general use and necessity for all, those few things in which the masses of the public had an interest in receiving regularly and reasonably, soon became the object of control or regulation, and here was the beginning of and reason for State control and regulation or State ownership.

Public Control.

Public control or regulation of Public Service Corporations by permanent commissions, has come and come to stay. Control or regulation exercised through such a body has many advantages over that exercised through regular legislative bodies or committees. The permanent commission will be a quasi-judicial body. It should be made up of members whose duty it will be, and who will have the desire, the time and the opportunity, to familiarize themselves with the questions coming before them. It should act only after thorough investigation and be governed by the equities of each case. It would in time establish a course of practice and precedent for the guidance of all concerned.

Experience also has demonstrated that this "supervision" should stop at "control" and "regulation" and not "manage," "operate" nor dictate what the management or operation should be beyond the requirements of the greatest efficiency and economy.

Management or operation requires intimate knowledge and experience which can only be gained by continuous, active and practical participation in actual working, while control or regulation can be intelligently exercised, after judicial hearing, by those who have not the knowledge or experience to operate.

State control or regulation should be of such character as to encourage the highest possible standard in plant, the utmost extension of facilities, the highest efficiency in service, rigid economy in operation, and to that end should allow rates that will warrant the highest wages for the best service, some reward for high efficiency in administration, and such certainty of return on investment as will induce investors not only to retain their securities, but to supply at all times all the capital needed to meet the demands of the public.

Such "control" and "regulation" can and should stop all abuses of capitalization, of extortion or of overcharges, of unreasonable division of profits.

If there is to be State control and regulation, there should also be State protection—protection to a corporation striving to serve the whole community (some part of whose service must necessarily be unprofitable), from aggressive competition which covers only that part which is profitable.

Governmental control should protect the investor as well as the public. It should ensure to the public good service and fair rates. It should also ensure fair returns to the investor.

A public utility giving good service at fair rates should not be subject to competition at unfair rates.

It is not that all competition should be suppressed, but that all competition should be regulated and controlled. That competition should be suppressed which arises out of the promotion of unnecessary duplication, which gives no additional facilities or service, which is in no sense either extension or improvement, which without initiative or enterprise tries to take advantage of the initiative and enterprise of others by sharing the profitable without assuming any of the burden of the unprofitable parts or which has only the selfishly speculative object of forcing a consolidation or purchase.

State control and regulation, to be effective at all, should be of such a character, that the results from the operation of any one enterprise would not warrant the expenditure or investment necessary for mere duplication and straight competition. In other words, the profits should not be so large as to warrant duplication of capitalization in the competition for the same business.

When thoroughly understood it will be found that "control" will give more of the benefits and public advantages, which are expected to be obtained by State ownership, than could be obtained through such ownership, and will obtain them without the public burden of either the public office-holder or public debt or operating deficit. It is conceded that as a rule private management is better, more economical and more efficient than public management, and much more advanced and enterprising. The economical margin between public and private management has been shown by experience to be more than sufficient to secure the best private administration.

When through a wise and judicious State control and regulation all the advantages without any of the disadvantages of State ownership are secured, State ownership is doomed.

State control of public utilities should not prevent progress, should be sufficiently unrestricting to encourage the introduction and demonstration of the value of any new or novel enterprise, and should allow sufficient reward for the initiative, enterprise, risk and imagination of the adventurers behind such enterprises. It should discriminate between the useful adventurers or promoters, pioneers in fact, and those pirates or sharks who, on the strength of other successes, extravagantly capitalize undeveloped ideas, and exchange the worthless securities for the savings of deluded and credulous investors. Corporate control and restriction should always exist to a sufficient degree to prevent such speculative promoting, and such stock-jobbing schemes.

The regulation or control of any new or novel thing which is a mere convenience and not a necessity can be left largely to the laws of trade; such a thing, if offered, much be offered at a price acceptable to the public, who are the customers, at a price which in the opinion of the purchaser leaves him a margin of profit either in convenience or enjoyment. Under such control private initiative can be depended upon for the introduction of everything believed to have possibilities.

The combination of the promoter, investor and capitalist, with their imagination, personality, optimism and desire, has been at the bottom of every development of every kind or nature which has benefitted the human race in the way of utilities, and still is the only way in which new utilities can be developed. Whenever any great works have been undertaken by governments they have been on lines of old development, based on experience of that which has been developed by the persistent genius and application of some individual or group of individuals.

State control or regulation, to be effective, should when exercised, be accepted and acquiesced in by the public. If all the decisions not in exact accord with the desire or contention of the public are condemned, if it is expected and required that all decisions be against the utilities controlled, if politics and political effect are to govern decisions, if decisions go for nothing with, and are not respected by the public, failure and disappointment are bound to follow, self-respecting men will refuse to act, the standard of appointments will fall and State control and regulation will become a disgrace, and the evils which it was intended to correct will multiply.

If any company gives good service, meets all the reasonable demands of the public, does not earn more than sufficient to provide for the maintenance of its plant up to the latest standard and for reconstruction of plant when worn out or obsolete, pays only fair dividends to its shareholders—if a company is only doing this its rates and charges to the public cannot be unreasonable.

Competition vs. Control or Regulation.

Effective, aggressive competition, and regulation and control are inconsistent with each other, and cannot be had at the same time.

Control or regulation, to be effective, means publicity; it means semi-public discussion and consideration before action; it means deliberation, non-discrimination; it means everything which is the opposite of and inconsistent with effective competition.

Competition—aggressive, effective competition—means strife, industrial warfare; it means contention; it oftentimes means taking advantage of or resorting to any means that the conscience of the contestants or the degree of the enforcement of the laws will permit. To make competition effective great and uncontrolled latitude of action is necessary; action must be prompt and secret.

Aggressive competition means duplication of plant and investment. The ultimate object of such competition is the possession of the field wholly or partially; therefore it means either ultimate combination on such basis and with such prices as will cover past losses, or it means loss of return on investment, and eventual loss of capital. However it results, all costs of aggressive, uncontrolled competition are eventually borne, directly or indirectly, by the public.

Competition which is not aggressive, presupposes co-operative action, understandings, agreements, which result in general uniformity or harmony of action, which, in fact, is not competition but is combination, unstable but for the time effective.

Fluorescence and phosphorescence, according to Professor W. D. Bancroft, are due to light emissions caused by chemical changes produced by ether waves. Fluorescent materials have been generally accepted as frequency changes of ether waves, and Prof. Bancroft's theory, which is amply confirmed by experiment, has aroused much interest among scientists.

Wireless telegraphy in mines has been the subject of investigation by German electrical engineers, who have succeeded in communicating through 250 yards of solid rock at the Hercynia salt works at Vienenburg and through 600 yards between adjoining mines with the receiver at the bottom of a 250 ft. shaft. This indicates that wireless communication through the earth's crust will be an event of the not far-distant future.

LOCOMOTIVE PRACTICE IN USE OF FUEL OIL.[1]

BY HOWARD STILLMAN.

About the first practical use to which fuel oil was applied as a means of generating steam in California was by the Central Pacific on a locomotive between Sacramento and Davisville. It was a comparatively thin oil of a reddish color and I think was a foreign product. The experiments were made to see if it were possible to make a locomotive steam with oil fuel. Results were quite satisfactory, but as the price was considerable the matter was dropped. The first regular conversion of a locomotive to oil burning in regular service was in November, 1900, and a number of tests were made in comparison with coal fuel that proved so satisfactory that in February, 1901, we were authorized to equip other engines. This was gradually done, and in about five years all locomotives were converted to oil burners. The approximate number of locomotives the Southern Pacific Company now have burning oil is as follows: Passenger, 396; freight, 455; switch, 140; total, 991.

On the above basis the monthly consumption is 677,875 barrels per month, or 8,134,500 barrels per year. These figures were for about six months ago and are slightly exceeded at this time. I am referring only to the Southern Pacific Railroad in California and extending to El Paso, Texas, embracing what are known as the Calvin lines.

The characteristics of the oil we burn have been fully covered in papers before you at the last meeting. There is of course a slight variation in gravity ranging from 14 to 15 Beaume. Its calorific value is taken at 18,500 B.t.u., which we consider as expressing its heat value. In various determinations that have been made, a slight variation in B.t.u. is found in the same sample by different observers. I think that Professor Le Conte's Fig. 1 well expresses a range of results that can be obtained with oils of the same gravity.

The following specifications for fuel oil has been adopted by the Southern Pacific System:

General Requirements.

This oil or "liquid fuel," is crude petroleum as received from the wells, or the product of crude petroleum, distilled or reduced. It must contain no sand or foreign matter in shape of sticks, waste, stones, etc., and must be sufficiently liquid to flow readily in 4-inch pipes at a temperature of 70 degrees Fahrenheit. It must contain as little water as possible, and oil containing more than 2 per cent of water and other impurities will not be accepted. Fuel oil will be paid for on basis of volume at 60 degrees Fahrenheit, also deducting all water contained, according to method outlined as follows:

Tests.

One sample will be taken from each carload or fraction thereof. The sampling of cars is to be made with car thief having valve at lower end. The thief with open valve will be lowered gradually into car and valve closed at instant of touching bottom. The thief thus filled will contain oil sample to be tested for water, sand and B. S. Oil received in settling or storage tanks will be sampled with Robinson or other standard thief, a sufficient number of samples being taken to secure an average of its contents.

[1]Paper presented at San Francisco meeting American Society of Mechanical Engineers' March 10, 1911.

1. Fuel oil will not be accepted for general use whose flash-point is less than 110 degrees Fahrenheit when tested by the open cup, Tagliabue method. The oil to be heated at rate of 5 degrees per minute, and test-flame applied every 5 degrees, beginning at 90 degrees. The above flash-point being the danger point at which the oil begins to give off inflammable gas, the fire or burning point is not required.

2. The test for water, sand and B. S. will be made as follows: 100 cubic centimeters of the sample will be placed in a 250 cubic centimeter graduated glass cylinder provided with stopper, and thoroughly shaken up with not less than 150 cubic centimeters of gasoline. The mixture will be heated to 120 degrees Fahrenheit for from 3 to 6 hours to facilitate the separation of impurities, the amount of which can then be read from the graduations of cylinder. All proportion of water and other impurities contained in the sample will be deducted from the volume contained in the car and not paid for.

3. The temperature of shipment will be tested directly as sample is removed from sampling tube, or by immersion of thermometer in the receptacle itself for not less than one minute. A deduction in volume for expansion at temperature of over 60 degrees Fahrenheit will be made at rate of one-twenty-fifth of one per cent for each degree. At 90 degrees the deduction would be one and one-fifth per cent, etc., Kansas and Oklahoma fuel oil furnished from Sugar Creek or Kansas City, Missouri, at 90 degrees, should have a deduction of one and one-fourth per cent.

4. Gravity of fuel oil should range between 13 and 29 degrees Beaume at 60 degrees Fahrenheit.

Conditions.

If any portion of an accepted shipment is subsequently found to be damaged, or otherwise inferior to the original sample, that portion will be returned to the shipper at his expense.

Any sample failing to meet all the requirements of this specification will be condemned, and the shipment represented by it will be returned to the manufacturers, they paying freight both ways.

Unfortunately for us in evolution of the principles of oil burning in locomotives, the matter resolves itself to one of local conditions. The modern locomotive boiler is not an ideal form of oil furnace. Railroads must burn whatever fuel is cheapest and most available, and the matter continues largely to be one of expediency. Locomotive boilers are designed for coal fuel. As above referred to, the application of oil fuel at the start was experimental. How long the oil would last or its market value render its use profitable was an unknown factor. It was formerly our boast that should emergency arise the oil burners could be converted over night in the roundhouse back to coal again. From the figures given us by Mr. Bell it does not seem at all likely that the contingency will soon arise.

Locomotive fuel oil is carried in tanks built to fit the coal space in tender. Additional flat tanks when required are placed over the coal space or back of it. Gravity supply is depended upon through flexible pipes to the locomotive. Each system of locomotive oil tanks on tender is provided with a gauge board or scale from which the fuel records are kept.

The style burner used is the flat jet type consisting of a flat casting divided longitudinally by a partition or table over which the oil flows as it is admitted to the upper cavity or box. The lower cavity receives the steam for the jet which strikes the oil flowing over

the partition, spraying or injecting it in the furnace. We aim to completely atomize the oil near the burner tip in order that it may be immediately vaporized. I would state here that we have experimented with and tested many kinds of burners in the past, but find that the simple form is the best. The form of burner is of little importance provided it is simple, easy to clean, and without complication from carbonizing. This is especially true of the heavy asphaltic California petroleum. It has in truth been said that those who try to improve the efficiency of oil fuel by alteration of the burner are on a plane with those who try to improve the steaming quality of a boiler by altering the injector. Provided a simple burner is properly set to deliver a thoroughly vaporized spray, each pound of oil will yield its quota of heat units if completely burned. By far the greater efficiency from oil fuel is in the arrangement of the furnace. The steam for atomizing is obtained from the dome and is available at full boiler pressure of 200 lbs. through a suitable regulating valve. We have used compressed air experimentally and for some time used a form of burner that delivered air inductively to the burner itself. Other than a localization of heat at point of the burner, no benefit could be found by tests with air mingled with the steam in this way. Atomization with compressed air is undoubtedly of value under certain conditions, but is liable to produce locally in the furnace a more intense heat than is desirable. With the steam jet the oil is sprayed and broken up so as to allow the air admitted through proper dampers to mix and consume completely without damage to the sheets. Tests on our locomotives by Professor Grey, formerly of the University of California, showed that temperatures ranging from 2500 to 2750 degrees Fahrenheit were obtained, the latter being the highest temperature observed. Firebrick, the most refractory obtainable, are placed at the lower side of the firebox plates to prevent impinging of the oil blast against the sheets. No more brick than necessary for the purpose are used. The most refractory brick melt out in a comparatively short time—not from an intense degree of heat, but from the fluxing agents introduced with the oil, especially salt or other alkalies with which our California petroleums are associated.

(To be continued.)

POLES PURCHASED IN 1909.

The total number of wooden poles purchased by pole consumers in the United States in 1909, according to the Bureau of the Census, was 3,738,740, which is the largest total ever reported. The gain over the number reported for 1908 was 489,586, or 15.1 per cent; and over that for 1907, 455,472, or 13.9 per cent. For the poles purchased in 1909 the sum of $7,073,826 was paid, which, although greater by $1,145,002 than the expenditure reported in 1908, was less by $1,007,942 than that in 1907, when the average cost of poles was greater than in other years. In 1909 the leading kinds of wood were cedar, chestnut, oak and pine, and poles made of these species formed 92.7 per cent of the total number purchased, and represented 95 per cent of the total cost. As in previous years, cedar and chestnut were most important, supplying, respectively, 65.3 per cent and 16.3 per cent of all poles purchased in 1909.

For cedar poles a steady increase is shown, but the number of chestnut poles purchased in 1909, though greater than the number in 1908, was less than that in 1907.

The growing use of oak is notable. In 1907 only 76,450 oak poles were reported, while the number was 160,702 in 1908 and 236,842 in 1909. Other kinds of wood for which steady gains are shown since 1907 are juniper, tamarack, Douglas fir and osage orange. For cypress, on the other hand, annual decreases were reported. More redwood poles were purchased in 1909 than in 1908, but considerably fewer than in 1907.

In 1909, as in previous years, by far the most important consumers were the telephone and telegraph companies, which purchased 2,916,005 poles, or 78 per cent of the total number reported. The electric railroad and electric light and power companies bought 627,414 poles, or 16.8 per cent of all poles purchased in 1909, and the steam railroad companies, 195,321 poles, or a little more than 5 per cent.

Since 1908 there has been an increase of 13.8 per cent in the number of poles purchased by the telephone and telegraph companies and an increase of 18 per cent in the number purchased by the electric railroad and electric light and power companies, while the largest gain, 25.7 per cent, is shown for the steam railroads. In comparison with 1907, however, only the purchases of the telephone and telegraph companies show an increase. The large gain in the returns for these companies is due partly to the omission in 1907 of data for many companies using only short poles.

Cedar and chestnut poles were bought extensively by each class of consumers. The telephone and telegraph companies used a wide variety of woods, reporting relatively large numbers of oak poles, nearly all the poles made of osage orange, and most of those made of tamarack.

The average cost of all poles purchased was $1.89 in 1909, as compared with $1.82 in 1908 and $2.46 in 1907. The somewhat high cost in 1907 is accounted for in part by the lack of complete statistics for that year as to the purchases of short poles, which, of course, have a low average value.

For the telephone and telegraph companies the average cost of poles purchased in 1909 was $1.40 per pole; for steam railroad companies, $2.83; and for the electric railroad and electric light and power companies, $3.89. The variations in these figures indicate in a general way the differences in the size or grade of the average pole suitable for the purposes of the different classes of companies.

Of the total number of poles purchased in 1909, nearly one-third were from 20 to 25 feet in length, and more than one-fourth were from 25 to 30 feet in length. Poles under 30 feet in length constituted nearly three-fourths of all poles purchased, while less than one-fortieth of the total number had a length of 45 feet or over.

Cedar was the leading kind of wood in all lengths of poles purchased. Of the oak poles, more than 92 per cent were under 25 feet in length, and by far the largest part were less than 20 feet in length. Osage-orange poles and other species were also purchased, principally in the short lengths. Many of the oak and

osage-orange poles were used by rural telephone lines or by the so-called "farmers' exchanges."

An increase in average cost since 1908 is shown for each group of poles having a length of 30 feet or over. On the other hand, poles under 20 feet in length cost 56 cents per pole in 1909, as compared with 62 cents in 1908, and poles from 20 to 25 feet in length 82 cents in 1909, as compared with 84 cents in 1908, while for those from 25 to 30 feet in length the average cost was the same in both years.

Of poles having a length of 45 feet or over, Douglas fir poles were purchased for the lowest average cost, while among the shorter lengths the lower-priced woods were tamarack, locust, oak and osage orange. The high average cost of pine poles was due to the fact that large numbers of these were treated poles. Redwood poles had a uniformly high average cost. These were probably mostly sawed, as over 98 per cent of redwood poles were so reported in 1906.

COMPLIMENTARY DINNER TO ELIHU THOMSON.

A complimentary dinner was given by the San Francisco office of the General Electric Company to Professor Elihu Thomson of Lynn, Massachusetts, at the Fairmont Hotel, April 5, 1911. The guests included a number of central station managers and engineers of the vicinity, together with members of the local staff of the General Electric Company. Near its close Dr. Thomas Addison, after extending the company's greeting and welcome to those present, introduced the honored guest of the evening, Professor Elihu Thomson, whose career has been so vitally connected with electrical progress, "much of which he saw, and part of which he was."

Professor Thomson's epigrammatic and inspiring address was concerned with scientific progress and its limitations. Premising his argument on the fact that "all progress is based upon discovery," he traced the work of the early investigators in the last century who found the principles upon which many of our great industries now depend. He stated that "the science of yesterday is the practice of today," and is due not so much to the man as to the age. In this manner, the speaker modestly passed over his own great accomplishments with the explanation that he could not help it.

When this work was first started, telegraphy and electroplating gold and silver were the only industrial applications of electricity, though soon succeeded by the telephone, which "was not so much an electrical discovery as a discovery of the exceeding sensitiveness of the human ear." The electric light was occasionally produced from batteries, but there were no dynamos or motors until the early seventies. There was no consideration of such things as power factor and load factor, nor were there any efficiency engineers. This last profession, by the way, the speaker thought, could be easily overdone, particularly in the extreme case of evaluating the cost per student hour, standardizing students like motors, or in determining the power factor of a church.

Looking upon the application of science from the purely physical side, the speaker sees a vast amount of work yet to be done. The present age, though one of wonderful development, will go down in history as one of fearful waste. The wastes of civilization are so striking and terrible as to require a book for their enumeration; food is sold in packages whose labels cost most than the article they contain; the iron and tin in a can is more valuable than the soup it holds, and many other such inconsistencies are yet to be corrected.

Though electrical machinery has high efficiency, often reaching 98 per cent, its prime movers, the heat engines, are lamentably inefficient. The speaker believes that the gas engine will eventually give the highest possible efficiency, more effectually utilizing the high grade fuel, such as oil, which is now being wasted in locomotive and other boilers. The public must be educated to understand the absurdity of selling oil for two or three cents a gallon and paying many times this price for carbonated and lithiated water, and it is to this end that the technical man of the future must exert his influence.

Thousands of cubic feet of natural gas are wasted in order that a little gasoline may be obtained by compression, whereas the constituent marsh gas might be liquified and shipped in properly insulated containers to even distant markets. Though the cellulose in sawdust can be converted to sugar and thence cheaply fermented to ethal alcohol, government restrictions and red tape bring the price up to fifty cents a gallon, which is prohibitive for power purposes.

The chemistry of the future, so Professor Thomson believes, is to play the most important role in man's advancement. In the electric furnace he will make diamonds for abrasive purposes, from the nitrogen of the atmosphere he will derive the fertilizers for enriching an impoverished soil, and by imitating many plant processes he will supply the needs of man. Particular emphasis was laid upon the possibilities of direct synthesis of ammonia from nitrogen and hydrogen, therefrom to extract the needed nitrates by oxidation.

The limits to which scientific progress may be advanced, this distinguished scientist believes, have been set by Nature in the countless ages during which the present perfection of plant and animal life has been evolved. He asked the question as to what heat engine can reach the 80 per cent efficiency of a man's muscles in converting food to work. He showed how man could also direct Nature forces, hyperbolizing a race of cannibal rats as a means of self-extermination, a selected breed of cattle to eat the spineless cactus and a method of sex segregation to solve the thriftless negro problem.

As examples of Nature's evolution that could well be emulated by man he compared the cold light of the firefly to the heat waste in our electric lights, or the sensitiveness of the human eye to that of a photographic plate, and he further cited the efficiency of the human ear in measuring and recording minute energy manifestations, and the delicacy of the sense of smell as developed in some of the lower animals.

"Civilization originated in curiosity," which has ever spurred the faculty of investigating matters, practical and impractical. In concluding, the speaker briefly summarized recent discoveries in the latter field, the electric theory of matter, the properties of the ether, star formation, and finally the problems as to how life originates in the universe.

Brief speeches were also made by H. H. Sinclair, John A. Britton and C. O. Mailloux of New York City, Mr. Britton in particular delivering a remarkable enconium of Professor Thomson's achievements in the world of science.

The guests present were: C. F. Adams, Dr. Thomas Addison, Wyatt H. Allen, R. H. Alton, R. M. Alvord, F. F. Barbour, Ralph Bennett, T. E. Bibbins, W. T. Bivens, Chas. N. Black, A. J. Bowie, John A. Britton, J. Q. Brown, W. W. S. Butler, W. C. Campbell, Prof. S. B. Charters, C. F. Conn, C. L. Cory, Dr. Cottrell, W. J. Davis Jr., P. M. Downing, Prof. W. F. Durand, C. F. Elwell, Geo. R. Field, S. L. Foster, Arthur H. Halloran, W. W. Hanscom, Geo. J. Henry Jr., Lewis H. Hicks, A. S. Heyward, Geo. C. Holberton, J. Hood, E. A. Hunt, H. F. Jackson, L. R. Jorgensen, S. E. Kearney, G. I. Kinney, W. F. Kelly, Henry A. Lardner, Prof. Joseph N. LeConte, S. J. Lisberger, C. A. Loring, S. G. McMeen, C. O. Mailloux, Geo. R. Murphy, S. L. Napthaly, Prof. C. G. Noble, F. W. Paterson, R. C. Peck, T. W. Ransom, M. Rhine, H. A. Russell, Prof. Harris J. Ryan, H. E. Shedd, W. M. Shepard, E. O. Shreve, H. H. Sinclair, H. C. Stanley, Frank Stone, A. Strauch, Prof. Elihu Thomson, A. V. Thompson, F. T. Vanatta, R. W. Van Norden, F. H. Varney, F. E. Vickers, W. G. Vincent, J. E. Woodbridge.

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Steam Turbine Auxiliaries

When the long distance transmission of power from hydroelectric plants was successfully established many small steam-driven isolated plants were eliminated, as their operators could not compete with such cheap power and were glad to go out of business in a dignified manner while the opportunity offered. Many industries which formerly relied upon a prime mover thus became dependent upon a transmission system whose weak points as regards continuity of service soon showed that a steam-driven auxiliary was occasionally necessary at the point of maximum distribution. When idle, this necessary investment added a financial burden so great as to seriously impair the low power cost advantages of the transmission system, and it was not until the advent of the steam turbine that the hydroelectric plant was relieved of this financial load.

The steam turbine has a large overload capacity and can be operated in synchronism with the transmission line when not supplying power. While thus "floating" on the line it takes only enough power to overcome mechanical friction and windage and requires little attention. Generally speaking, power from the steam turbine plant cannot be sold as cheaply as from a transmission system. To get the highest commercial efficiency, presupposing a regular water flow, a transmission system must operate with unity load factor; this is manifestly impossible without a diversified distributing system, in fact, the load factor might be so low as to make the power cost higher than that from an auxiliary steam plant, which then becomes a desirable investment. By making the steam plant's capacity greater than the requirement for handling all of the load peaks, the transmission system is given the higher load factor essential to economy. Furthermore the auxiliary plant is ready in emergency to take over a large part of the load. The combined plant can thus be rated at a greater capacity than that of the original hydraulic installation and a part of the gross earnings may be credited to the auxiliary plant.

In large cities there is always an opportunity to supply power at a low load factor. As the isolated steam turbine plant is able to compete, in a small way at least, with the transmitted supply, the field of the small plant is again opened and the rapidly growing additions of not only central station plants but isolated plants in industrial and public buildings is again noticeable. The growth of the application and use of power is far greater than is generally thought and the transmission systems are loading with that class of business which offers steady loads. Beyond this some means must be provided for taking much business which they do not reach and this is the sphere of the new era of steam driven stations.

PERSONALS.

C. R. Collins, of the Seattle Electric Company, is at San Francisco.

Robert Sibley, consulting engineer, Missoula, Mont., was at San Francisco this week.

Thomas Mirk, of the engineering firm of Hunt, Mirk & Co., is at San Diego on business.

George B. Murch, an electrical supply man of Los Angeles, was a recent San Francisco visitor.

J. H. Harisberger, superintendent of the Seattle-Tacoma Power Company, spent the past week at San Francisco.

C. C. Lapham, of Los Angeles, who is interested in wireless telegraphy and telephony, is a San Francisco visitor.

Van E. Britton, gas engineer, is supervising the high pressure gas installation at Willows and Red Bluff, California.

W. G. Kerckhoff, president of the San Joaquin Light & Power Corporation, has returned to Los Angeles from New York City.

A. G. Wishon, general manager of the San Joaquin Light & Power Corporation of Fresno, was a San Francisco visitor during the past week.

F. G. Baum, of F. G. Baum & Co., electrical engineers, left last Tuesday on a business trip to New York, which will occupy several weeks.

Robert M. Frick, of San Francisco, has been elected vice-president of the Bay Cities Home Telephone Company, as successor to S. G. McMeen, resigned.

S. F. B. Morse, Jr., a son of Professor S. F. B. Morse, the inventor of telegraphy, was at San Francisco last Monday from Merced, where he has mining interests.

J. P. Bradner has resigned as sales engineer with Pierson, Roeding & Co. of San Francisco and will look after his private interests for a time before deciding upon future affiliation.

Leon M. Hall, electrical engineer, left for the San Joaquin Valley last Wednesday on business connected with the construction of an impounding dam on Quintos Creek, for a large irrigation project.

John Coffee Hayes, general manager of the Mt. Whitney Power Company of Visalia, and also connected with the management of the La Grange Power Company, has returned from a business trip to New York.

P. M. Hansen, managing director of the Auckland Electric Transit Company of Auckland, New Zealand, passed through San Francisco last week en route to London to attend the coronation of King George.

A. B. Cass, president of the Bay Cities Home Telephone Company, and also of the Los Angeles Home Telephone & Telegraph Company, spent the past fortnight at the San Francisco office of the former corporation.

J. B. Lukes, who has charge of the Stone & Webster Company's work at Reno, Nev., has been spending a few days at San Francisco. His company handle the Sierra Nevada Power Company's system for the W. P. Hammon interests.

TRADE NOTES.

The Grays Harbor Railway, Light & Power Company, of Aberdeen, Wash., has purchased from the General Electric Company, through the Seattle office, a 1000 kw. Curtis turbo-generator set as auxiliary equipment. It will be installed in the Anderson-Middleton Lumber Company's plant at Aberdeen. This company will furnish the necessary steam for the turbine.

LOS ANGELES SECTION A. I. E. E.

The regular meeting of the Los Angeles section of the American Institute of Electrical Engineers was held at Blanchard Hall, March 28, 1911, with an attendance of 96 members and visitors. Mr. A. H. Babcock gave a discussion from the standpoint of the Southern Pacific Company on the specifications for overhead crossings of electric light and power lines. The specifications were also touched upon by some of the other speakers. The meeting was honored by the presence of two past presidents, Prof. Elihu Thomson and Mr. Bion J. Arnold, both of whom addressed the meeting. Addresses were also made by O. H. Ensign and J. A. Lightipe and by the following visiting engineers: Prof. W. F. Durand, G. L. Hoxie of New York, Kempster B. Miller and S. G. McMeen of Chicago, and Prof. C. L. Cory.

The 1911 Pacific Coast Convention was discussed and regret was expressed that some of the distinguished visitors would not be able to be with us at that time. A letter from President Jackson with reference to the constitutional amendment was read and discussed. The meeting then adjourned.

Previous to the meeting the local executive committee entertained at dinner at the University Club the speakers mentioned, as well as Theo. B. Comstock, engineer Los Angeles Board of Public Utilities; W. G. Vincent of San Francisco, Geo. A. Damon of Chicago, R. J. Cash, Los Angeles manager General Electric Company; M. M. Corbin and G. H. Hill of the General Electric Company, Schenectady, New York; E. F. Scattergood, electrical engineer of the Los Angeles Aqueduct; Horatio A. Foster, associated with Mr. Arnold; S. H. Anderson, electrical engineer Pacific Electric Railway, and C. G. Watson, superintendent Ontario & San Antonio Heights Railway.

The local executive committee consists of J. E. MacDonald, chairman; secretary of Joint Pole Committee; E. R. Davis, electrical engineer Pacific Light & Power Company; I. T. Dyer, superintendent telegraph, Salt Lake Road; J. A. Lighthipe, electrical engineer Southern California Edison Company; R. H. Manahan, city electrician; E. R. Northmore, superintendent Los Angeles Gas & Electric Corporation, and V. L. Benedict, manager Los Angeles Fire Alarm Company.

After the meeting A. L. Havens, the Los Angeles manager of Pierson, Roeding & Co., entertained the visitors at the Jonathon Club.

NEW CATALOGUES.

The Duplex Metals Co. of Chester, Pa., in "The Copper Clad Handbook," give valuable facts and figures about the manufacture and characteristics of Copper Clad wire.

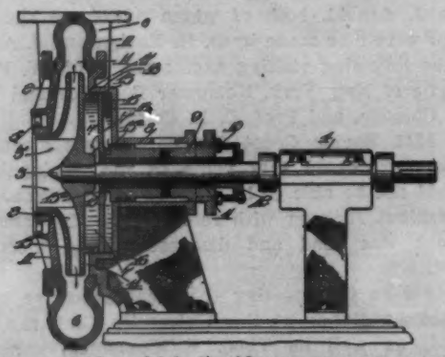
Electrical Engineers Equipment Co. of Chicago, Ill., has issued a catalogue of electrical fittings for power plants manufactured by them. Much interesting tabular data is included in the booklet.

In Bulletin No. 4815, recently issued by the General Electric Company, are illustrated and described continuous and alternating current motors, and apparatus for controlling them when applied to machine tool operation. The publication contains also illustrations of the motors installed on drills, saws, shapers, milling machines, slotters, planers, lathes, etc.

One of the recently issued publications of the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., is Circular No. 1191, covering multiple and multiple series metallic flame arc lamps, which are used for lighting places where direct current is available and where high intensity illuminating units are required, such as, business streets, parks, freight yards, mills, car-barns, foundries, machine shops train sheds, etc.

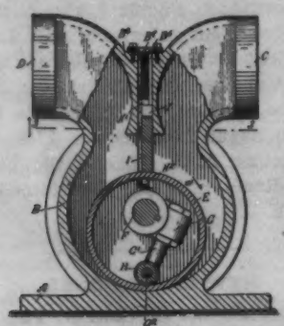
PATENTS

987,976. Turbine-Pump. Walter L. Forward, West Berkeley, Cal., assignor to Byron Jackson Iron Works, Berkeley, Cal. An automatic balancing means for a turbine pump, such means comprising a casing having inlet and discharge passages, a runner or impeller mounted upon a shaft and revoluble within the casing, said impeller and casing form-



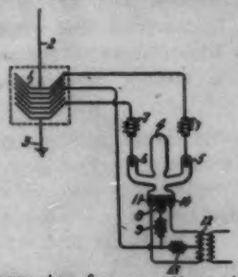
ing chambers within which liquid pressure may accumulate, and said impeller having ports near its circumference and axis forming communication between said chambers and means whereby the ports are automatically controlled by the endwise movement of the runner.

987,711. Rotary Pump. Adelbert Fournier, Sprague, Wash., assignor to James F. O'Brien, Seattle, Wash. A rotary pump, comprising a cylinder having an inlet and an outlet, a ring-shaped piston mounted in the cylinder to roll on the inner surface of the cylinder, an abutment mounted to slide in the said cylinder and connected with the



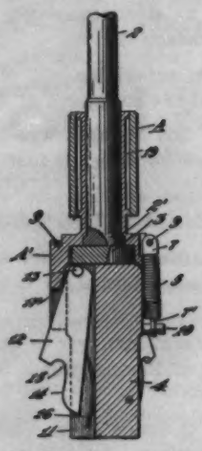
said piston to move in unison with the latter, a driving shaft extending eccentrically through the said piston and axially through the said cylinder, arms on the said driving shaft, rollers in contact with the inner surface of the said piston, and adjustable connections between the rollers and the said arms.

987,924. Rectifying System for Aluminum Cell Lightning-Arresters. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. The combination with an elec-



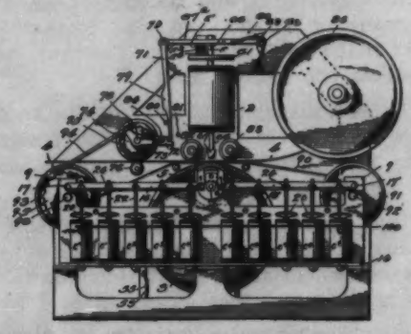
trolytic lightning arrester for an alternating current system, of a mercury arc rectifier connected to derive a unidirectional potential from said system and to impress it on said arrester.

988,054. Beading-Tool for Boiler-Tubes. Eugene Witt, San Francisco, Cal. A multiple beading tool, comprising a tool holder and a suitable support therefor, means holding the tool holder to the support while allowing it to yield



longitudinally thereof, a series of radially movable beaders mounted in said yieldable holder, and means for imparting a series of blows through the tool holder simultaneously to all the said beaders.

988,218. Electrical Signal-Recording System. Alfred L. Sohm, Whittier, Cal., assignor to Sohm Electric Signal & Recording Company, Los Angeles, Cal. A device of the character described, comprising a plurality of numbered signal sending means, means to record any selected digit from 0 to 9 in the units place on a suitable receiving medium, means to record any selected one of a series of digits in the tens place on said receiving medium, a series of coils corresponding in number to the units digits and adapted upon being energized to select the digit to be recorded in the units place by the first named recording means, a series of coils corresponding in number to the tens digits and adapted upon being energized, to select the digit to be recorded in the tens place



by the second named recording means, each of said units digit-selecting coils being in electrical communication with all signal sending means whose unit digit corresponds to the units digit, the selection of which is controlled thereby, and each of said tens digit-selecting coils being in electrical communication with all signal sending means whose tens digit corresponds to the tens digit, the selection of which is controlled thereby, electrically actuated means to produce forcible contact between said recording means and said receiving medium, said contact means being adapted to be energized by a local battery circuit and means to automatically close said local battery circuit through said contacting means when said recording means is in operative position, substantially as described.

INDUSTRIAL

AN ELECTRICALLY OPERATED GAS METER.

A useful laboratory method for measuring the passage of a quantity of gas of any kind is to insert an electric heating coil in the pipe, measuring the temperatures of the stream of gas before and after passing the heater. Knowing the specific heat of the gas—that is, the heat necessary to raise 1 cu. ft. of it 1 deg. in temperature—and having measured the electrical energy converted into heat by the coil, the volume of gas passed can easily be computed. Again, if with the same arrangement we vary the current flowing in the heater so that the difference in temperature shown by the thermometers remains constant, the electrical energy taken by the heater and measured by a watt-hour meter will be exactly proportional to the gas which has passed.

A practical meter designed for measuring the flow in large gas mains which accomplishes automatically the regulation of the heating current to keep the temperature difference of the two thermometers constant at 2 deg. Fahr. is the invention of Prof. C. G. Thomas, of the University of Wisconsin. The stationary measuring element, Fig. 1, which is inserted in the main pipe carrying the gas or air to be measured contains an electrical heating coil B, and on each side of the heater are two screens of fine resistance wire EE having the function of thermometers, arranged as the arms of a Wheatstone bridge. Variations in the temperature difference between these two screens cause deflections in a galvanometer needle, making contacts to close magnetic clutches and by means of a motor-driven ratchet wheel and rheostat increasing or diminishing the energy flowing into the heater. The recording watt-hour meter which measures this energy input into the heater is calibrated to read directly in cubic feet of gas. The electrical energy to operate the meter is approximately 1 kw. per 75,000 cu. ft. of illuminating gas, with the screens set for 2 deg. Fahr. difference in temperature. This figure varies, of course, for different gases measured.

The principle of the meter thus enables it to measure gas or air at any temperature and at any pressure, its accuracy not being affected by fluctuations of either, since in heating gas or air the temperature rise depends upon the mass of the gas, not its volume. Whether 1 lb. of air occupies 10 cu. ft. or is expanded to 100 cu. ft. the amount of electrical energy taken to raise its temperature 2 deg. is identical, and whether the gas is moving rapidly or slowly through the meter exactly the same amount of energy will be required. If the gas enters the meter at 60 deg. its temperature will be raised to 62 deg. If it enters at 100 deg. Fahr. its temperature will be raised to 102 deg., so that, as stated above, neither temperature nor pressure has any effect on the accuracy of the meter's measurements.

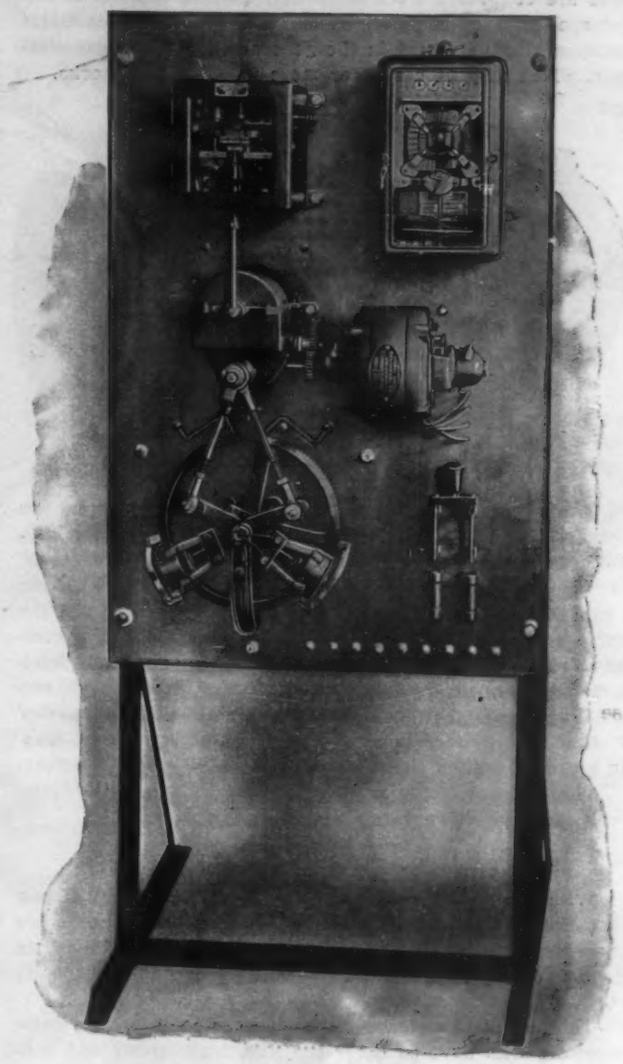


Fig. 2. Switchboard and Recording Mechanism of Thomas Electric Gas Meter.

The important features of the meter are: There are no moving parts inside the gas main. This meter measures weight or mass of gas instead of volume as do other meters,

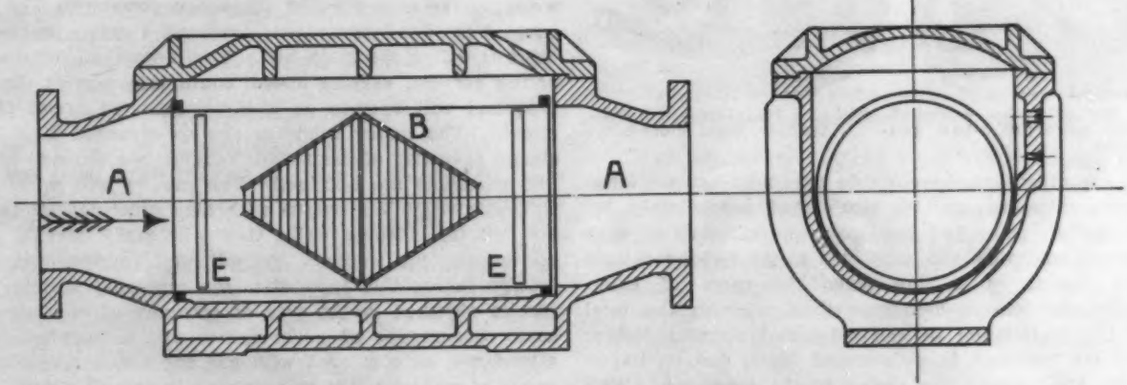


Fig. 1. Heater and Thermometer Element of Thomas Gas Meter.

and will read directly in standard cubic feet regardless of temperature or pressure, its operation being independent of temperature or pressure and of fluctuations in either. Meters of very large capacity occupy but little space, and since the parts are connected electrically they can be located at any distance from each other. The recording mechanism, for instance, may be placed in the general offices of a gas company, which may be a mile or more from the gas works.

Fig. 3. Thomas Gas Meter.

The principal applications of the Thomas meter are measuring illuminating gas, natural gas, blast-furnace gas, compressed air, air flow in ventilating or forced-draft systems, etc. Since in the operation of the meter about 1 kw.-hour is consumed for the passage of each 75,000 cu. ft. of gas the device becomes a desirable load for the central station company to have on its lines. The consumption is largely long-hour business, while, due to the superior inherent characteristics of this meter, it is applicable to a large number of other uses besides the eminently satisfactory one of mak ing a central station customer of the competing gas company.

The Thomas meter is manufactured by the Cutler-Hammer Company, Milwaukee.

PORTABLE TELEPHONE SETS.

With the spread of telephone train dispatching among the railroads in this country, a piece of apparatus has come into extensive use on such lines, and every day sees its adoption to a greater extent. This is the portable telephone set.

This set is being used by officials in their private cars, inspectors who have to cover the line, train crews and construction, bridge and wrecking gangs.

Fig. 1. No. 1330—Set equipped with powerful 5-bar generator.

Fig. 2. No. 1331—Set with leather case, closed.

The advantages of the portable telephone set are striking. Communication can be established immediately between a distant point and headquarters by means of such a set carried on trains, and connected to the telephone train wires by means of a line pole. In cases of emergency, this one feature has more than paid for the total cost of the installation of the telephone circuit. Delays to traffic are reckoned in dollars and cents, and on important lines, such delays are tremendously expensive. With a telephone at hand, and the conductor or someone else able to give headquarters detailed advice in regard to conditions on the spot, hours are frequently saved.

Three of the sets in general use among the railroads are those manufactured by the Western Electric Company and known as the Nos. 1330, 1331 and 1332 types. The first named is declared by the manufacturers to be the most efficient set on the market today. It is equipped with a powerful 5-bar generator and finished with a special weatherproofed varnish. The construction is of the strongest throughout, and the corners are reinforced with steel. The hand set in this particular case is attached to a 6-foot cord so that the user may stand upright when the set is on the ground, and a push-button is provided in this hand set so that the transmitter circuit is closed only when desired.

Fig. 3. No. 1332—A small and light talking set, in leather case.

The No. 1331 set is of similar design, but equipped with a 3-bar generator. The No. 1332 set is for use on train wires where the dispatcher is at all times connected with the circuit, and it has no generator.

Many of the roads are equipping every train on their line with these sets, and their use on wreckers is very general. In some cases, the portable telephone set is made part of the standard equipment of the engine.

On the Seaboard Air Line some of the conductors recently petitioned to be allowed to purchase these sets for their own use, out of their own pockets, so greatly did they appreciate the advantages of such apparatus in times of emergency.

LARGE WESTINGHOUSE MOTOR ORDER.

The Westinghouse Electric & Manufacturing Company of Pittsburg, Pa., has recently received an order from the Kern River Oilfields of California, Ltd., calling for the largest number of oil well motors ever placed in this territory at one time. The order is for early delivery and calls for one hundred motors, which will be used in the Kern River field for pumping and cleaning the great number of oil wells on the properties of the above company. The motor adopted is of the back-geared type and a pulley on the countershaft drives the main belt. The motors are of the alternating current, varying speed, continuous service, induction type and will operate on a three-phase, 60 cycle, 440 volt circuit. The motor windings are so arranged that by the simple operation of the switch handles two economical working capacities are obtained. The motors will operate continuously at 10 h.p. output with high efficiency on pumping service; for cleaning wells, they will easily develop 30 h.p. on intermittent service. For oil well service, this double feature makes this type of motor especially suitable. The results obtained in the way of economy of operation, both as to consumption of power and to cost of maintenance and attendance, as compared with gas and steam operation, will prove of great interest to operators in the oil fields.

NEWS NOTES

INCORPORATIONS.

REDLANDS, CAL.—The Coachella Valley Ice & Electric Company has been incorporated by W. F. Holt, Chole Holt and W. G. Driver, with a capital stock of $300,000.

OAKLAND, CAL.—The American Heat & Power Company has been incorporated by J. H. King, J. A. Craig and J. H. Becker, with a capital stock of $100,000.

SAN FRANCISCO, CAL.—The Oakland, Antioch & Eastern Railway Company has been incorporated by A. W. Maltby, L. Arnstein, J. R. Selby and A. J. Kantmeyer, with a capital stock of $80,000.

SPOKANE, WASH.—The Mountain Lake Power & Irrigation Company has been incorporated by T. Z. and L. T. Gillett and C. T. Camplan. The company will take over the Carp Lake project, in Goldendale, and irrigate 10,000 acres.

SALEM, ORE.—The Kingwood Park Light & Water Company has been incorporated by Geo. P. Dekum, Rollun K. Page and Chas. A. Robertson The new company will construct transmission lines across the river at Kingwood Park and power will be procured from the Portland Railway, Light & Power Company

TRANSMISSION.

ELGIN, ORE.—E. W. Rumble has presented to the council an ordinance for a franchise for 50 years, to allow running a power line in the city. The power is to be harnessed in the Wallowa river.

SAN BERNARDINO, CAL.—The Union Power Company, preparing to develop power in Bear Creek canyon, has filed claim to 3000 inches of water in Bear Creek. The appropriation is made under the name of D. R. Paramore, who states that power is to be developed for the use of San Bernardino, Riverside, Orange and Los Angeles counties.

NEWPORT, ORE.—The franchise and plant of the Newport Power Company has been sold to Henry Hewitt, J. J. Hewitt and Seymour H. Bell, Tacoma and Portland capitalists. The new owners will spend $30,000 on the reconstruction and re-equipment of the plant. New buildings and new wiring system throughout the city are the changes propored. The new company will be known as the Yaquina Electric Company.

SAN FRANCISCO, CAL.—At a meeting of the finance committee of the supervisors last week the site for the proposed power house for the Geary street municipal railroad was announced. The committee declared in favor of locating the plant on two 50-vara lots on the west side of Jones, between Beach and Jefferson streets. One of the lots is owned by E. A. Norton and is held at $30,000, and the other, which is owned by Mary's Help Hospital, is held at $35,000. Options have been obtained on the property, and the committee requested the city and county attorney to look into the titles of the same.

ILLUMINATION

SPOKANE, WASH.—Spokane Falls Gaslight Co. will add 8 new benches and erect a retort building at a total cost of $100,000, this summer.

GRANTS PASS, ORE.—A. W. Butler of the Grants Pass Gas Company, says plans are now being drawn for necessary buildings and portion of the machinery ordered for the gas plant.

EAGLE ROCK, CAL.—A franchise for building an electric lighting system in Eagle Rock district has been sold to the Eagle Rock Water Company.

ROSEBURG, ORE.—W. F. Boardman of San Francisco and Thos. D. Petch of Medford, Ore., will apply for a franchise to operate a gas plant here.

LODI, CAL.—The Western State Gas & Electric Company has purchased a lot on Cherokee lane, just south of Railroad avenue, for the site of a new sub-station and transformer house.

WINONA, WASH.—M. W. Fockler of this place states that he has purchased 8½ acres one mile west of this place and will erect a power house for supplying light to Endicotte, Lacrosse and this place.

SPOKANE, WASH.—The Spokane Gas Company is contemplating increasing the capacity of its gas plant, located on the Northern Pacific tracks at Scott street. The improvements contemplated will mean the expenditure of $100,000.

ASHLAND, ORE.—H. G. Butterfield, foreman of the construction for the completion of the municipal electric light and power plant, made the estimates of cost of completion for street lighting and house lighting service system for the city at $17,657.

PETALUMA, CAL.—Manager H. H. Weber of the Pacific Gas & Electric Company, has received word from the San Francisco office that the contract for the erection of the gas-holder on the corner of First and C streets, had been awarded to an Eastern firm.

SAN FRANCISCO, CAL.—The Manila Electric Railroad & Lighting Corporation directors have declared a quarterly dividend of 1½ per cent on the $5,000,000 stock, payable April 1 to shareholders of record March 20, thus increasing the annual rate from 4 per cent to 5 per cent.

MACDOEL, CAL.—The California Butte Valley Land Company has contracted with the Siskiyou Lighting Company to bring electricity into the town of Macdoel for lighting and power purposes, including the furnishing of 8000 h.p. to farmers for pumping. The power is to be ready for use by July 1.

BRAWLEY, CAL.—The City Council has been asked to sign a contract for the city which provides for furnishing electricity for a period of two years at a minimum rate of $40 a month for 40 h.p. Motor Superintendent McCormick of the Holton Power Company, states that the company will furnish poles and transformers. The rate is 5 cents a kilowatt.

SEATTLE, WASH.—The Seattle Electric Company has declared an extra dividend of 2 per cent on the common stock along with the regular 1¾ per cent quarterly distribution (the rate paid since October, 1909), both payable April 15, to holders of record March 13. The usual 3 per cent (semi-annual) payment on the $5,000,000 preferred stock will be made April 1 to holders of record March 13.

SAN FRANCISCO, CAL.—U. S. District Judge Van Fleet has modified the restraining orders heretofore granted in what are known as the gas rate cases, in which the Metropolitan Light & Power Company attacked the rate fixed by the Supervisors for the past two years as confiscatory of the company's property. The order is modified so as to require the company to put all moneys received in excess of the rates fixed by the Supervisors into the Mercantile National

Bank of San Francisco, to be held by the bank subject to the future orders of the Court.

MODESTO, CAL.—To supply Turlock, Denair, Ceres and farm homes on the route between Modesto and these places, with gas from its Modesto plant is the plan of the Modesto Gas Company. The plans as thus far perfected contemplate a 2½ inch gas main connecting the cities named with the enlarged gas manufacturing plant of the company on Ninth street in the southern part of town. It is thought that this will deliver sufficient gas to supply the demand for the immediate future, and the company plans to enlarge the connecting main as more gas is needed.

BAKERSFIELD, CAL.—Eight gas compressors have been shipped from Pennsylvania by the Bessemer Gas Engine Company to be used in extracting gasoline from the gas wells of the Honolulu Consolidated Oil Company in the Buena Vista hills. On their arrival work will begin on the plant, which will be the first attempt on a large scale to utilize the Buena Vista natural gas for this purpose. It is stated that the Bessemer company, which has established a permanent office here in charge of W. D. Shira, has made propositions to companies owning gushers in the West Side fields to erect plants and extract gasoline on a royalty basis from the gas now going to waste from these flowing wells.

TRANSPORTATION.

PORTLAND, ORE.—The Council has granted to the Mt. Hood Railway & Power Company a 25-year franchise to operate an electric light and power system in this city.

SAN JOSE, CAL.—The San Jose Railroads Company has asked for an opportunity to bid for a franchise on North Fifth street, between St. John and St. James streets, and on St. James street, between Fifth and Sixth streets.

WILLOWS, CAL.—Two hundred prominent residents and business men of Redding, Red Bluff, Corning, Williams, Woodland and Willows, have held a meeting to organize a company to build and maintain an electric railroad from Woodland to Redding.

FRESNO, CAL.—The Hanford & Summit Lake Railroad Company will extend its line from Hardwick, in Kings County, to Jamison, 26 miles west of this city. The line will be 36 miles in length, and, with the exception of four miles, will be located in Fresno County.

OAKLAND, CAL.—Damages in the sum of $331,200 is demanded of the San Francisco, Oakland and San Jose Consolidated Railway (Key Route) by Henry Dalton & Sons' Company because of the alleged unlawful cutting off of the plaintiff concern from deep water by a bulkhead constructed by the railway corporation.

SPOKANE, WASH.—The Panhandle Electric Railway Company, headed by Victor M. Smith of New York, will expend $2,000,000 in the construction of a plant at Priest River, Idaho, capable of developing 30,000 h.p. It is announced the company will also build a transmission line from Priest Rapids to Spokane.

SEATTLE, WASH.—A new interurban electric line is proposed to be constructed between Seattle and Lake Burien, four miles south of the city limits, according to the petition for a franchise presented to the Board of Commissioners by Geo. W. H. Write. The board has set the date for hearing on the petition at 2 p. m., April 18.

LAKEPORT, CAL.—A mass meeting last week started a public movement to build a railroad from Hopland to Lakeport. W. J. Thomas, superintendent of the Mill Valley and Mount Tamalpais railroad, spoke at length on the possibilities of such a road. The president of the businessmen's association, of Lakeport, appointed a committee of five to confer with the officials of the Northwestern Pacific Railroad. It is proposed to finance the road entirely by private stock subscriptions from citizens of Lake County and Hopland.

SAN FRANCISCO, CAL.—For the purpose of hauling its freight trains between Sacramento and Chico, the Northern Electric Company has turned out what is probably the largest electric locomotive in the world. It is mounted on a car 57 feet long, and has two motors aggregating 600 h.p. The designer is J. P. Edwards, head of the company's electrical department.

REDONDO BEACH, CAL.—It has been ordered that a third rail be laid along the Los Angeles and Redondo railway right of way over a portion of Pacific avenue and Diamond street. The order calls for immediate compliance. It is understood that when the work is completed passenger cars over the Los Angeles-Pacific system will be transferred from the Sherman barns to this point.

OAKLAND, CAL.—Work has begun upon the roadbed for the new electric line of the Southern Pacific to San Leandro, which is an extension of the Seventh streets local line from Melrose, the present terminus. A large force of men have commenced operations in Dutton avenue and are working toward the northwest to meet the line from Melrose. From Melrose the line passes through Melrose Heights and Seminary Park districts, after which it closely parallels the Foothill boulevard to Broadmoor. A private right of way through this tract has been secured and from the junction of this right of way with Dutton avenue the railroad will extend to and span San Leandro Creek, and continue along Santa Clara avenue, to Estudillo avenue, where the new terminus is to be located. If the trustees of San Leandro will secure a right of way for the company's double tracks from Dutton avenue the railroad will construct a concrete bridge across San Leandro Creek. This would provide a new road between the annexed districts and eastern San Leandro, and relieve the congestion along Hayward avenue.

OAKLAND, CAL.—At last week's meeting of the City Council, Attorney Chapman stated that the Oakland Traction Company would apply for no more franchises after the new charter goes into effect on July 1. The reason, he said, is that the company cannot afford to pay the city the 5 per cent on the gross earnings as demanded by the charter, and at the same time pay 6 per cent on foreign money borrowed for building lines. Among the traction company applications was one on East Sixteenth street, recommended for passage. On another, Market street, from San Pablo to Fifty-fifth street, no action was taken. In the application for a franchise on Thirteenth street from Washington to Market, the application was withdrawn with the consent of the Council, and Chapman announced that he would offer as a substitute an application on Thirteenth street from Washington to Market, and south on Market street to First. As a solution of the congestion in Broadway, caused by the switchback between Seventh and Eighth streets, the company asked for a franchise in a loop around the block bounded by Broadway, Franklin, Eighth and Ninth streets.

TELEPHONE AND TELEGRAPH.

AUBURN, CAL.—J. B. McCleary has applied for a telephone franchise in this city.

WILLIAMS, CAL.—Amiel M. Harris has purchased the telephone line in this city and plans enlarging the system.

SUSANVILLE, CAL.—The California & Oregon Telegraph Company has applied for a 50-year telephone system in this town.